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ABSTRACT

The document has been designed to provide enlisted men assigned to the 3"/50 gun with a self-study, on-the-job-training source for shipboard use. The material covered includes general description and operation, functions of various components, disassembly and reassembly, maintenance, and operational casualties of the 3"/50 gun. Detailed photographs and drawings accompany the text. (AG)

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NAVPERS 10110

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THE 3"/50 GUN

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CE 000 283

Bureau of Naval Personnel
Washington, D.C. 20370

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PREFACE

This publication has been designed to provide enlisted men assigned to the 3''/50 gun with a self-study, on the-job-training source for shipboard use. This information has been derived from the strip film series SN-1806 on the 3''/50 Caliber Gun Mount Mark 22.

The material covered includes the general description and operation, the functions of various components, the disassembly and reassembly, the maintenance, and the operational casualties of the 3''/50 gun. The titles at the beginning of each section clearly define material to be found therein. The material itself is presented in a simple step-by-step format and can be used in part or as a whole.

First Edition 1965

CE 000 283

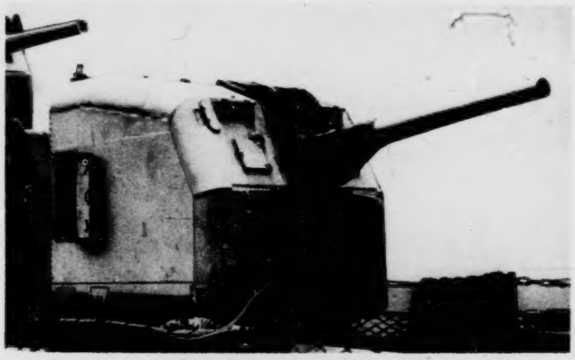
GENERAL DESCRIPTION AND OPERATION

The introduction of the airplane in warfare has had an important influence on the design of naval guns.

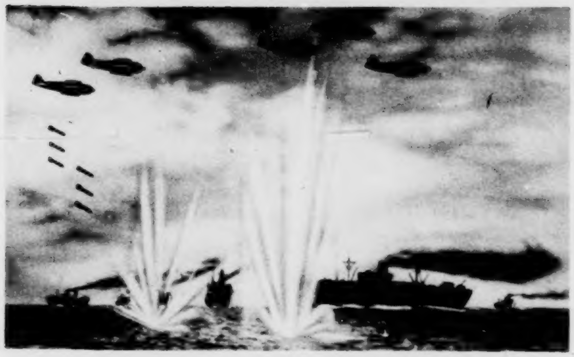
The Navy has had to develop new weapons to combat high level bombers and to break up dive bombing and torpedo plane attacks.

These guns had to be capable of elevation almost to the vertical in order to reach up into the sky and destroy these new enemies.

They also had to have high rates of fire if they were to be effective against fast-moving targets.

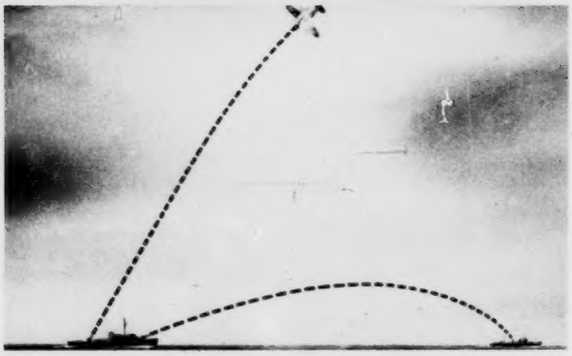


For the larger fighting ships, from destroyers on up, these problems were met by the development of the five inch, thirty eight caliber gun, with its power drive, projectile hoist and director control. But this was not the complete answer, for there were...



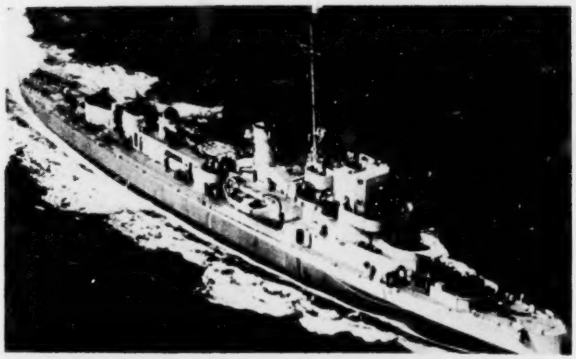
... many other vessels that needed protection from these hit and run attackers from the sky, as well as from underwater marauders and surface raiders.

The answer for these other vessels was the 3"/50—gun developed for WWI and improved to meet the conditions of WWII. It was one of the most useful weapons the Navy had at the beginning of WWII.

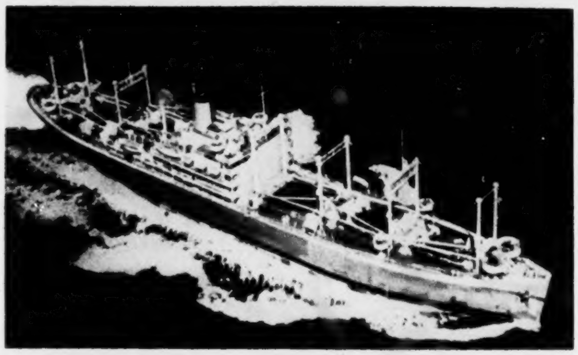


It is a dual purpose gun. It can fire effectively on both air and surface targets. One of its important advantages is that it can be installed easily on vessels too light to mount one of the heavier dual purpose guns.

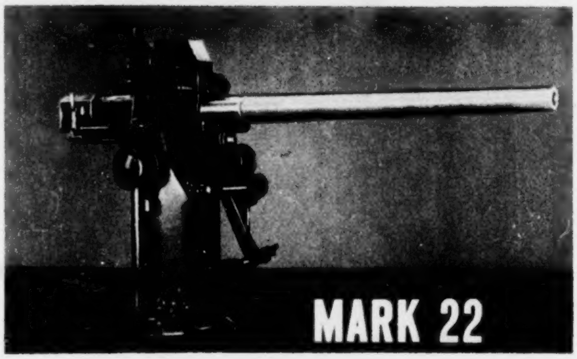
The 3"/50 caliber gun is used as the main battery of some destroyer escorts...



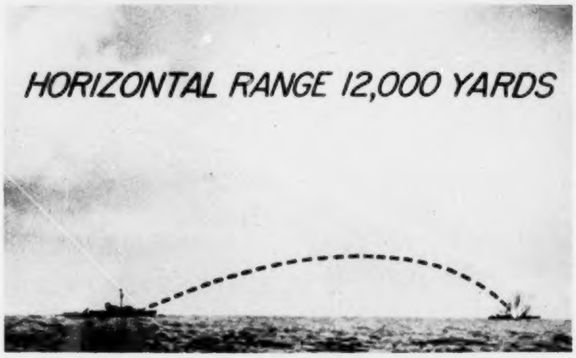
...and on many tenders, supply ships and other smaller vessels. Also, many armed merchantmen rely on the gun for protection against planes and surfaced subs.



The 3"/50 has several types of mounts to suit various purposes. The mount we shall study is the Mark 22.

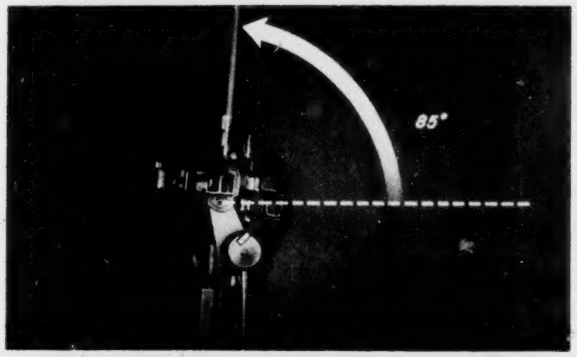


This gun has a maximum horizontal range of 12,000 yards—a little over six miles.

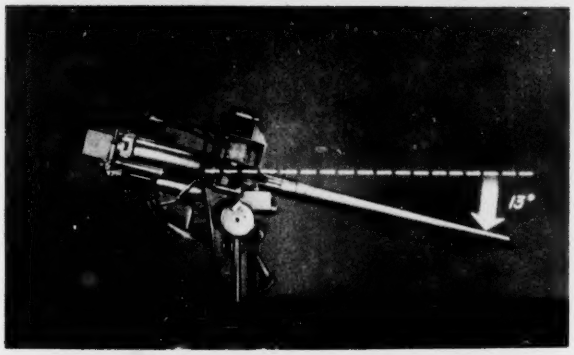


CEILING
21,500 FEET

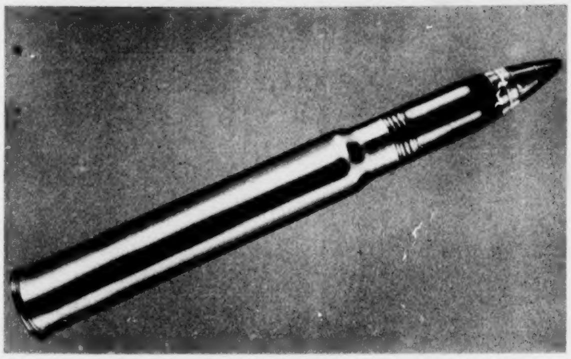
Its maximum ceiling is 21,500 feet—about 4 miles—straight up.



One reason why the gun is so effective against high level planes is that it can be elevated to 85 degrees for anti-aircraft fire.

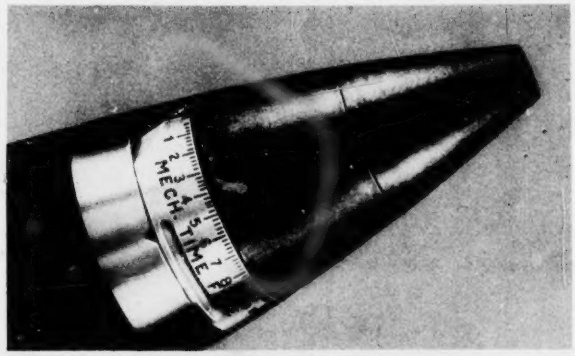


It can be depressed 13 degrees below the horizontal for use against surface targets at short range. That's why the submarines fear it.

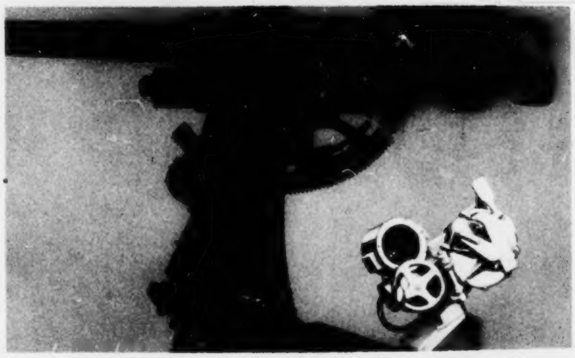


The gun uses fixed ammunition, in which the projectile is attached to the cartridge case. Several types of ammunition are supplied for various purposes.

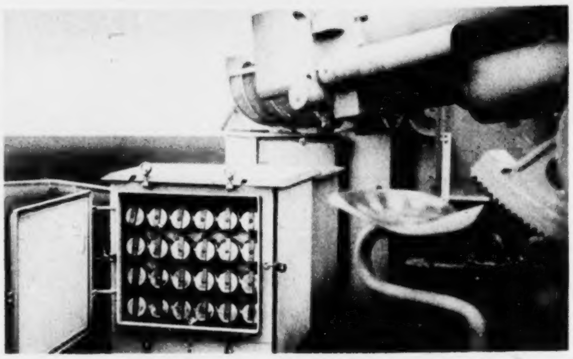
The anti-aircraft projectile has a time fuze in the nose. This fuze can be set to detonate the explosive charge at any desired point during flight. The projectile is thus made more effective against aircraft, since it can destroy a plane without making a direct hit.



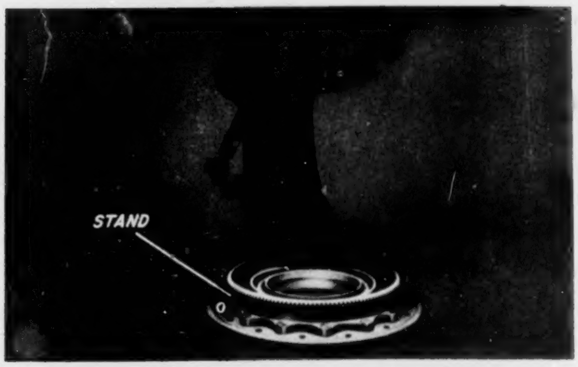
The nose fuzes are set at this fuze setter located on the left side of the mount, aft of the pointer's station.



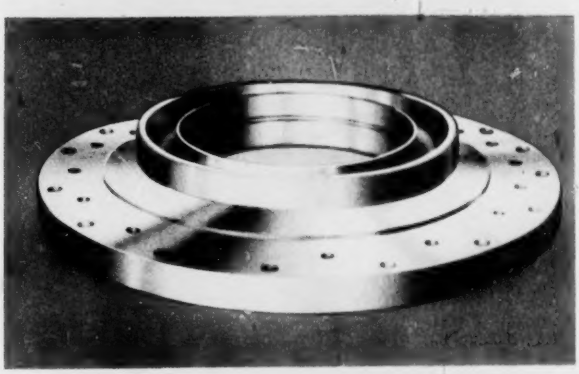
A supply of ready-service ammunition for each 3"/50 is kept in lockers on deck, close to the gun itself. The main supply is kept in the magazines below. At general quarters ammunition is passed from the magazines.



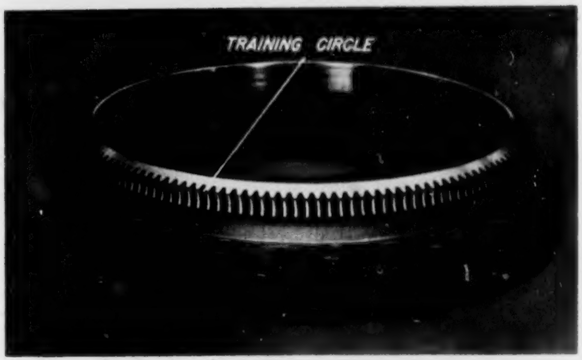
This gun is a complete unit in itself. It is operated entirely under manual control—which makes it only as good as the crew that mans it.



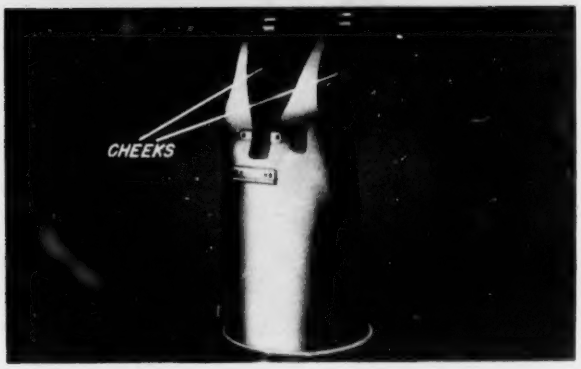
Fast manual control of this gun is made possible by the lightness and balance of working parts. Let us start our study of its principal parts with the stand.



The stand is bolted to the deck. It is a heavy steel casting that provides a fixed base around which the mount is trained.



To the outside of the stand is bolted a training circle which makes it possible to train the mount.

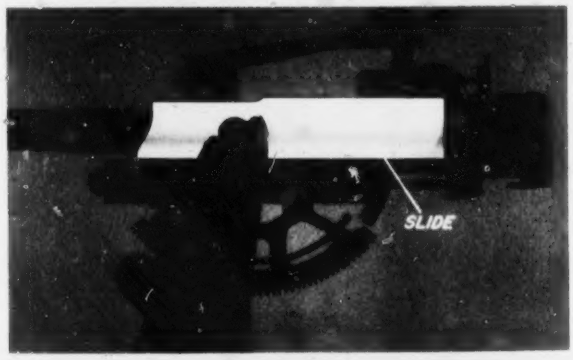


Mounted on the stand is the carriage—a large, heavy casting that serves as a support for the slide and gun. The cheeks or side plates of this carriage are much higher than on a single purpose gun, to permit elevation to the high angles required for anti-aircraft fire.

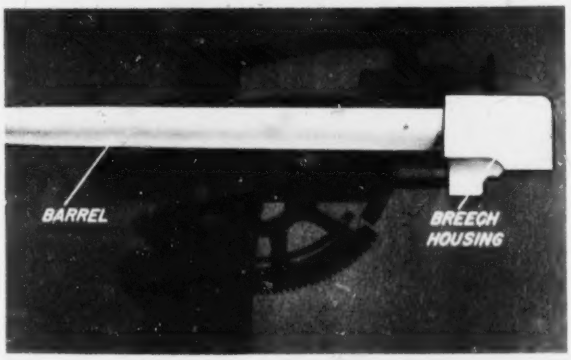
At the top of each cheek is a trunnion bearing in which a trunnion, which is part of the slide, pivots in elevation and depression.

TRUNNION
BEARING

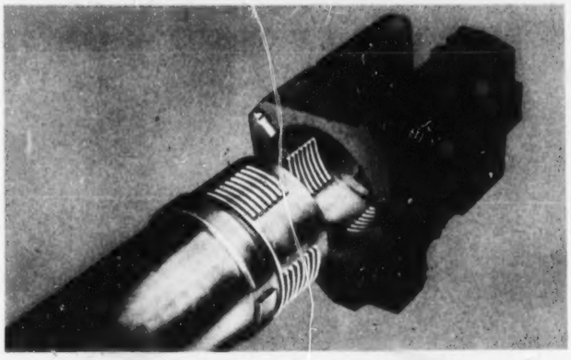
The slide supports the gun and guides it in recoil and counterrecoil.

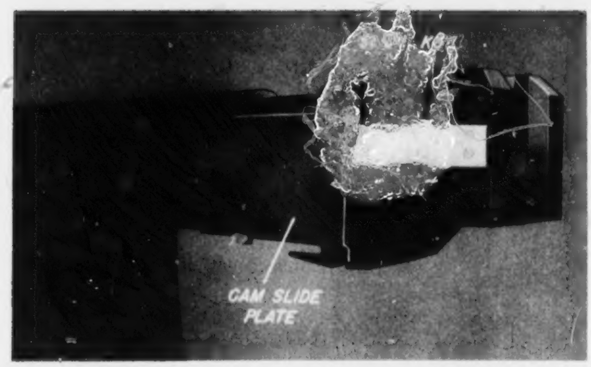


The gun supported in the slide consists of an assembly of barrel and breech housing.

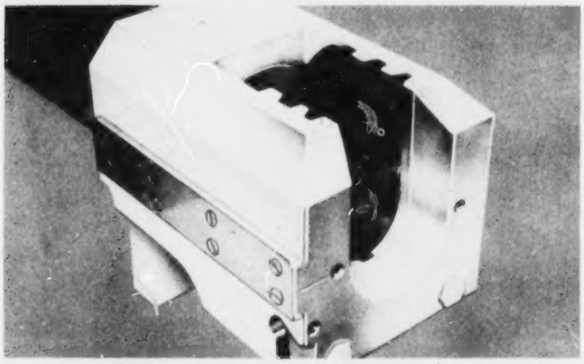

BARREL
BREECH
HOUSING

The barrel and breech housing are secured together by a bayonet type joint, or interrupted thread.

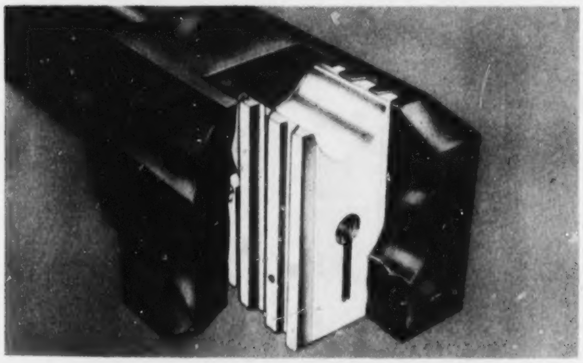




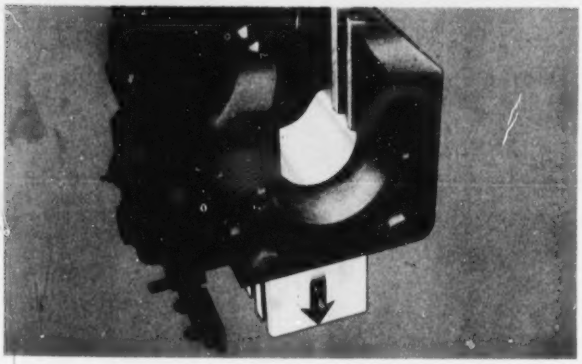
A slide key attached to the left side of the breech housing slides in a key slot cut in a cam slide plate secured to the side. This arrangement prevents the barrel from rotating in the side during recoil and counter-recoil.



But the main purpose of the breech housing is to act as a carrier for the breech block.

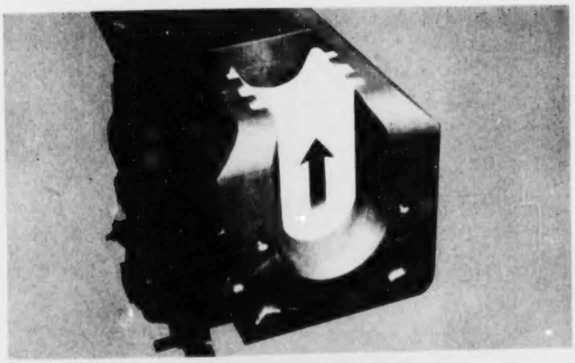


This breech block, operated by a fast-acting mechanism, is one of the main reasons for the high rate of fire that makes the 3"/50 a valuable anti-aircraft weapon.



The block is of the vertical sliding wedge type, guided by grooves cut in the breech housing. It rides down in these grooves to open the breech and permit a round to be loaded into the gun chamber. . . .

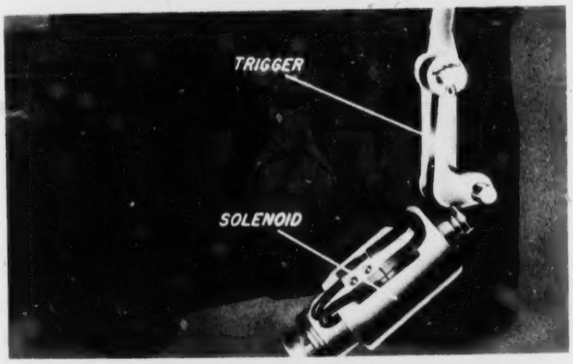
. . . and then is snapped up to close the breech, so that the gun may be fired.



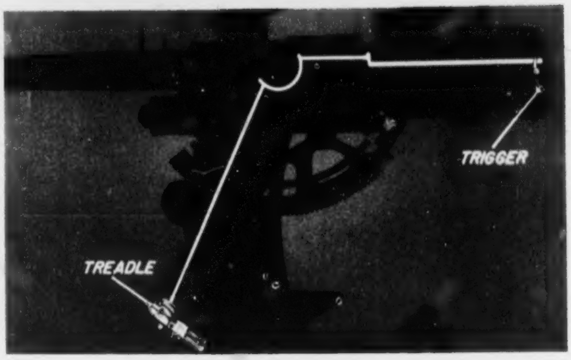
A round loaded in the gun is fired by the firing mechanism which is located in the breech block.

FIRING MECHANISM

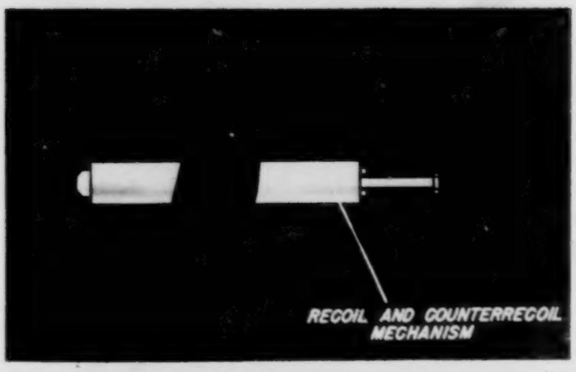
The firing mechanism is released by a trigger located on the cam slide plate. This trigger can be tripped by an electro-magnetic device known as a solenoid, which is operated from the pointer's firing key. Firing by this means is the preferred method.



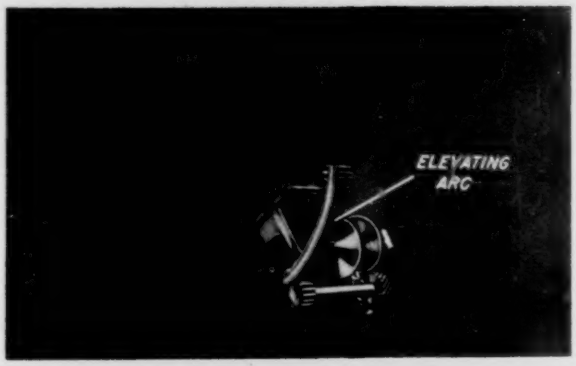
The trigger may also be tripped mechanically by a linkage of rods and levers from a pointer's foot-firing treadle to the trigger.



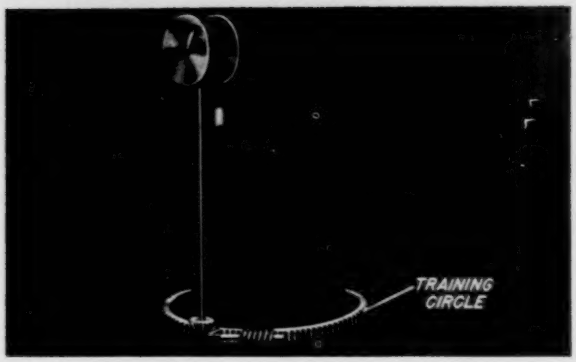
It is also possible to trip the trigger by hand.


RECOIL AND COUNTERRECOIL MECHANISM

Recoil and counterrecoil of the gun are controlled by a hydraulic mechanism aided by springs. This mechanism is contained in a cylinder mounted on the underside of the slide. Directly beneath the cylinder...

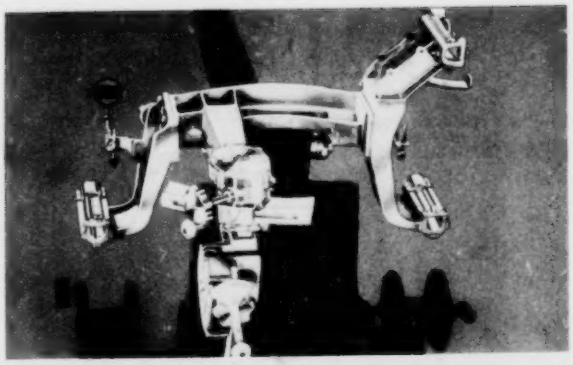

ELEVATING ARC

. . . is the elevating arc, by which the gun is elevated and depressed. This arc is driven by the pointer's handwheels.

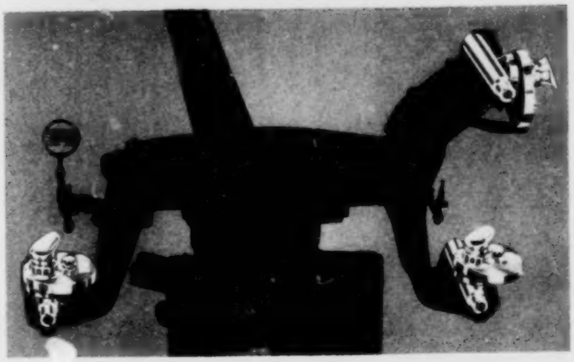

TRAINING CIRCLE

The mount is trained by the trainer's handwheels, which are geared to the training circle.

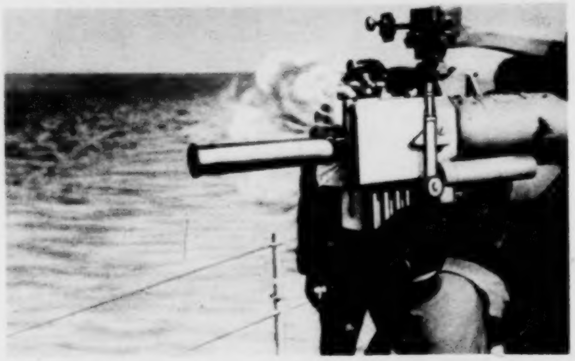
The sights, mounted on the slide, are of the yoke type—that is, a yoke extends across the slide...



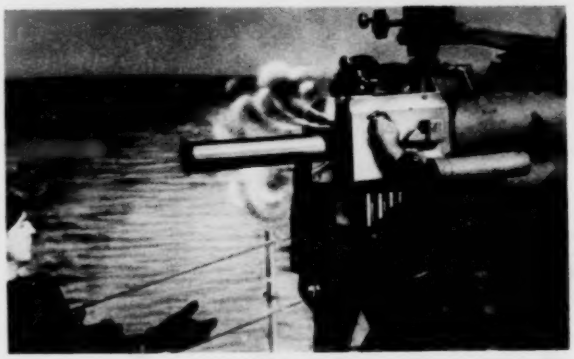
...to provide a means for mounting telescopes for the pointer, trainer and sight checker.

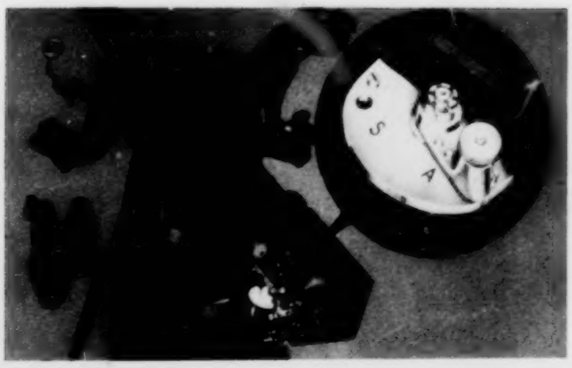


The 3"/50 caliber gun may be operated in either of two methods—automatic fire or single fire. Automatic fire is the usual and preferred method as it makes possible a high rate of fire. It provides for the automatic opening of the breech, after the firing of each round, to extract and eject the fired case.

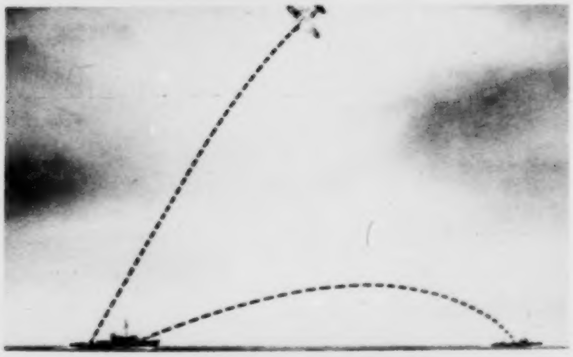


In single fire the breech must be reopened manually to permit extraction and ejection of the fired case.

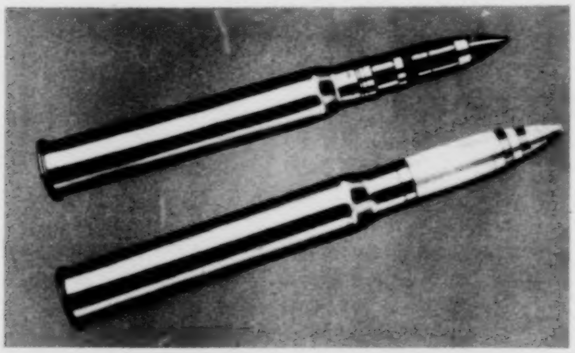




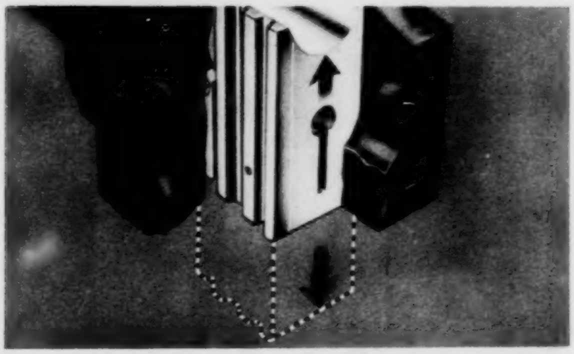
A cam plate retractor is set at "A" for automatic fire, or at "S" for single fire. This retractor is located on the cam slide plate. On newer mounts, the cam plate retractor has been omitted.



In later films we shall describe in detail all the features of the gun that are here treated in outline. To review briefly the points we have covered we know that:—the 3"/50 is a dual purpose, rapid fire gun which...

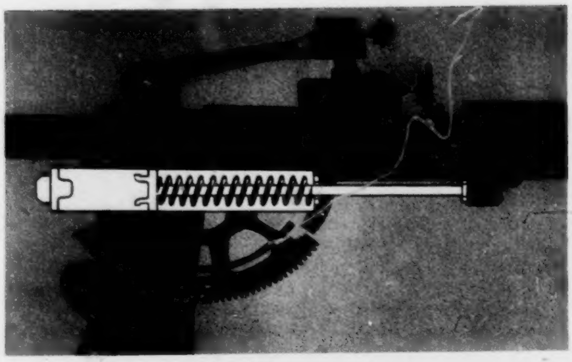


...uses fixed ammunition of various types.



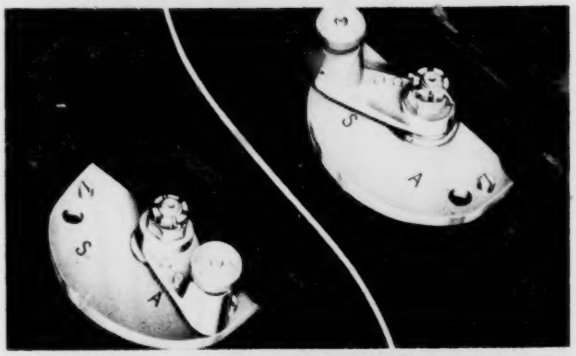
The breech is opened and closed by a vertical sliding wedge breech block.

The gun is controlled in recoil and counter-recoil by a hydraulic system that is aided by springs.

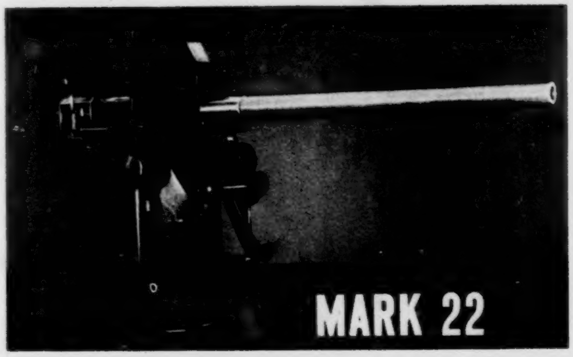


Training, elevating and sighting are entirely under manual control.

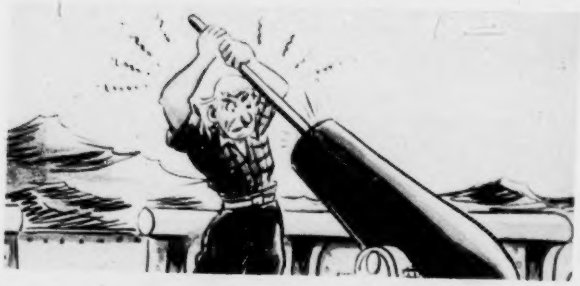
The 3"/50 may be operated automatically or by the single-fire method.



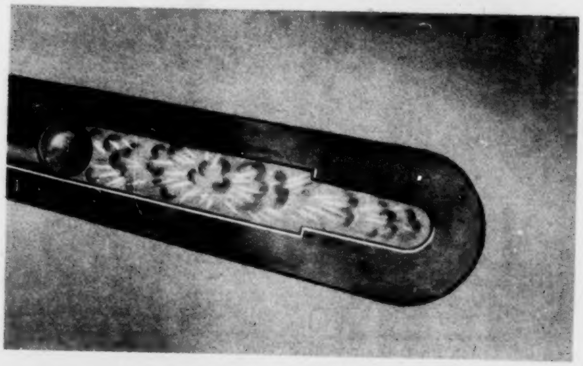
In a word, the 3"/50 is a useful and dependable gun of simple, rugged construction. It is easily operated and will provide a high rate of fire at all times if it is kept in good working order by thorough, consistent maintenance. In your study of this gun, bear in mind this important point: This gun will be only as good as the crew that mans and services it!



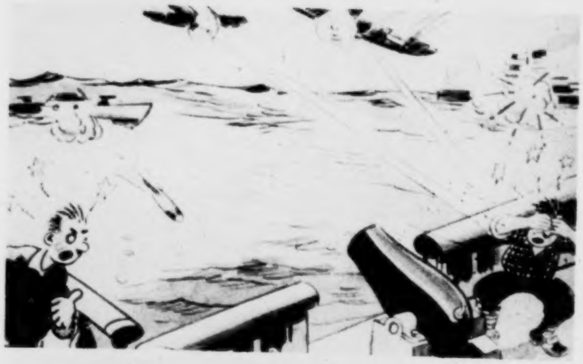
FUNCTION OF THE BREECH MECHANISM



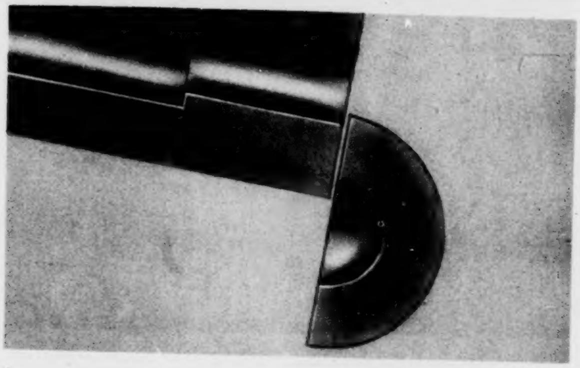
During the civil war a gun was little more than a heavy pipe closed at one end and loaded through the muzzle with powder and some form of projectile.



The science of naval gunnery has made great progress since those days, but the principle of firing is still the same. Powder explodes in a tube closed at one end; this creates gases which expand under terrific pressure and can escape only by pushing a projectile out through the open end of the tube.

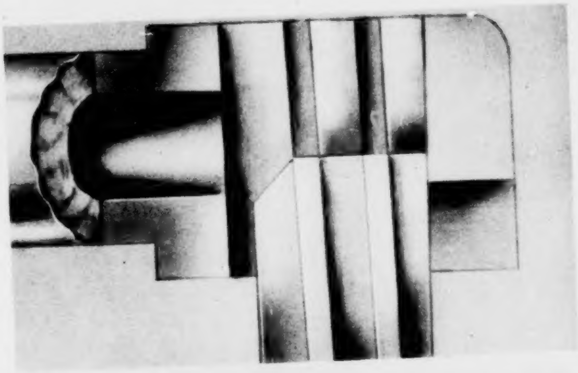


While the principle of firing is the same as it always was, the old muzzle loader would be sadly out of place against the high speed targets of modern warfare.



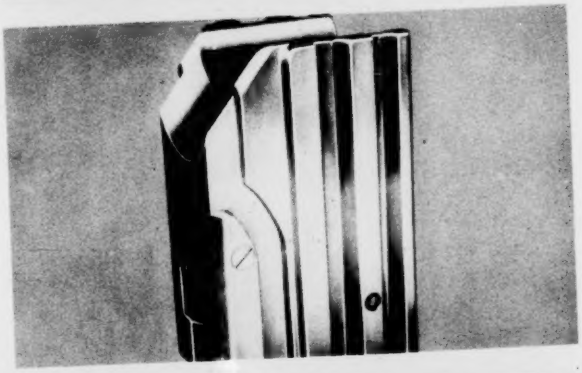
But long before the conditions of modern warfare arose, the old muzzle loader had been developed into a breech loader. The breech end became a breech mechanism, which closed the breech to fire the gun and opened it to permit the loading of a new round.

For rapid opening and closing of the breech loading gun, a movable block is required. This block and the parts that operate it are called the breech mechanism. In the 3"/50 caliber gun the breech mechanism serves not only to open and close the breech but also to do an additional job...

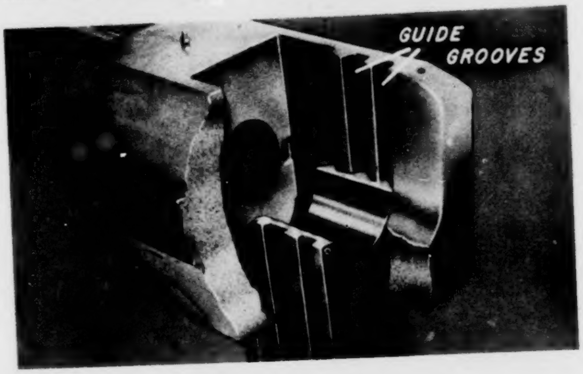


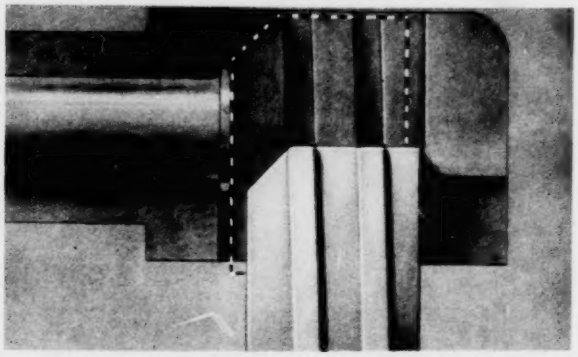
that of extracting and ejecting the fired cartridge case. The rate of fire of the 3"/50 is dependent to a large extent on the smooth and efficient operation of its breech mechanism. If you are to operate this gun so it will perform at peak efficiency in combat, you must understand clearly how the breech mechanism operates.

Let's start our study of this mechanism with breech block which is called a vertical sliding wedge block because...

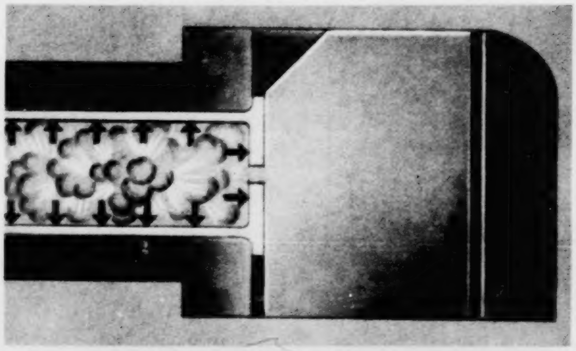


. . . it slides in vertical guide grooves cut in the breech housing

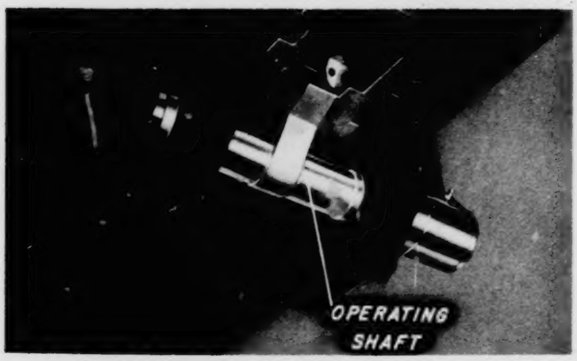




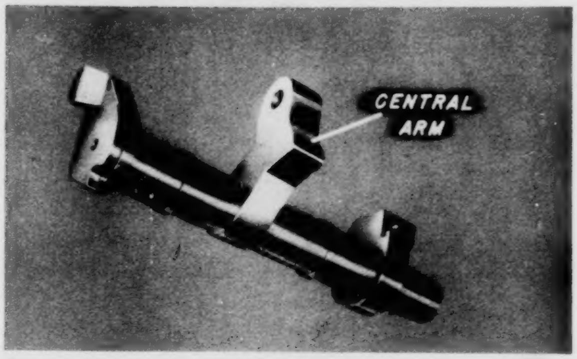
and as it rises it follows a slight forward tilt of the groove to wedge the round tightly into the breech.



After the block has seated the case, the gun is fired. The tremendous force of the explosion expands the case to seal the chamber, thus providing a gas check or a means of preventing the escape of gas at the breech.

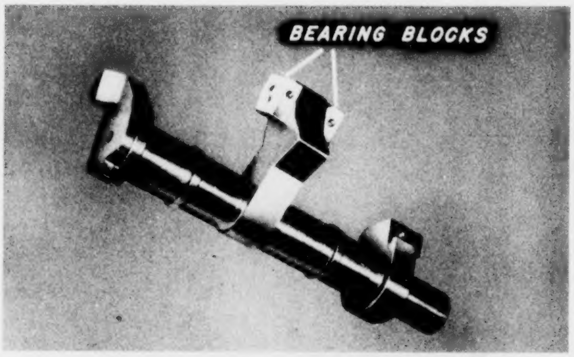


Looking up under the after end of the gun, we see that the operating shaft raises and lowers the breech block. This shaft rotates in bearings attached to the breech housing. Let's consider first how the block is moved by the shaft.

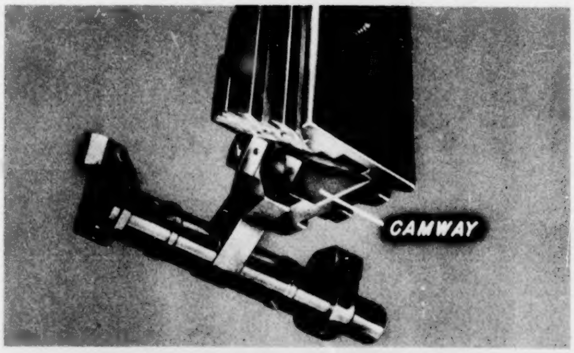


On the operating shaft is a central arm.

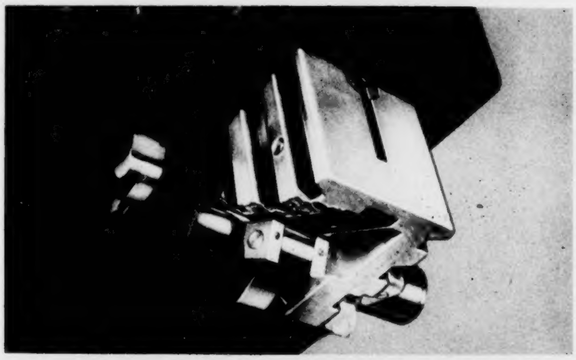
Two bearing blocks pivot about a pin extending through the end of the central arm. These blocks...



ride in camways cut into the lower central part of the breech block. As the operating shaft is rotated...

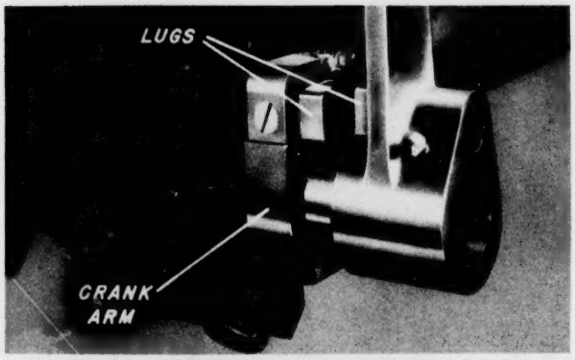


the central arm and the bearing blocks are moved aft and down. The bearing blocks riding in the cam ways lower the block. Thus we see how the rotating motion of the shaft produces a vertical motion of the block.

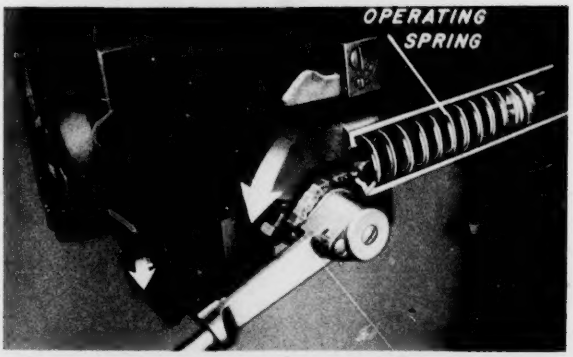


A hand operating lever located on the right side of the breech housing can be used to rotate the operating shaft and thus lower the breech block. This lever...

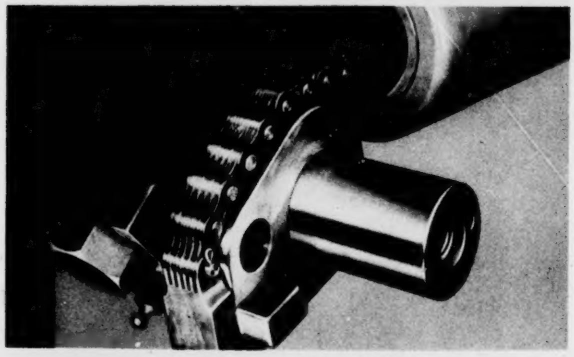
HAND OPERATING
LEVER



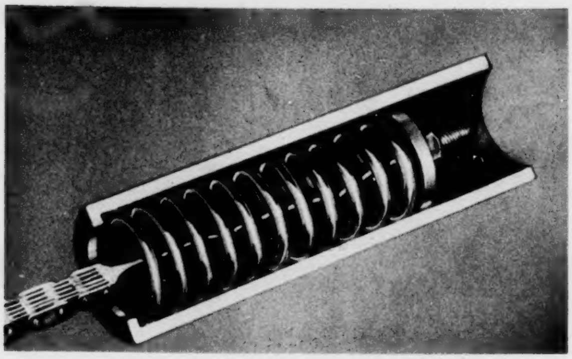
pivots on a bearing at the right end of the operating shaft. We have slipped the lever partially off the bearing to expose two lugs, one on the lever and one on the crank arm. These lugs engage to rotate the operating shaft when the lever is pulled down.



As the operating shaft lowers the block, it also compresses an operating spring housed in a steel tube mounted on the right side of the breech housing.

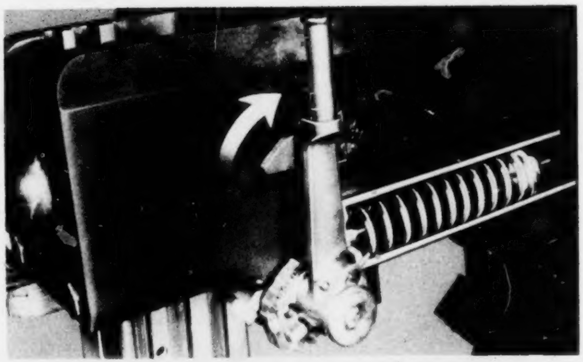


A chain connects the crank arm to the operating spring...

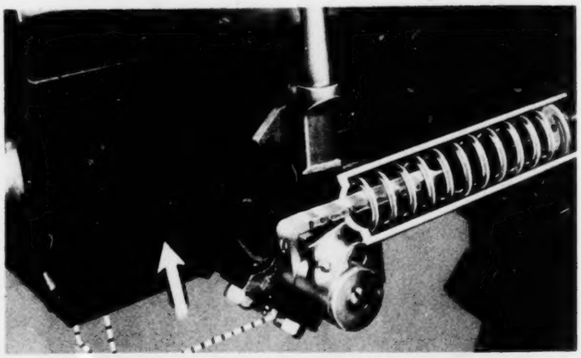


...by means of an operating spring rod, attached to the forward end of the operating spring.

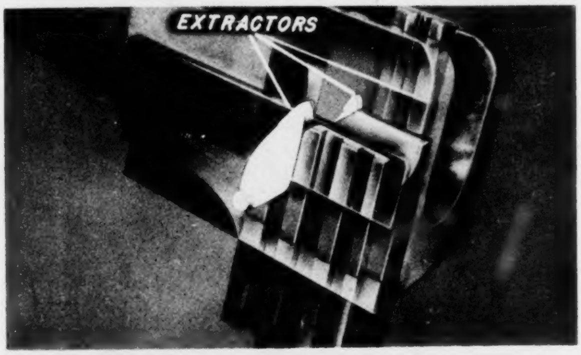
After the block has been lowered, the hand operating lever can be returned to its up position without disturbing the block or releasing the compression of the operating spring. The block is now latched in the down position by a mechanism we shall see presently.



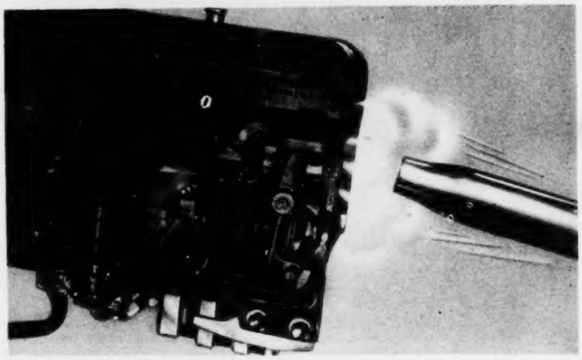
When the block is unlatched it is raised by the compressed operating spring to close the breech. The latching and unlatching of the block is accomplished...

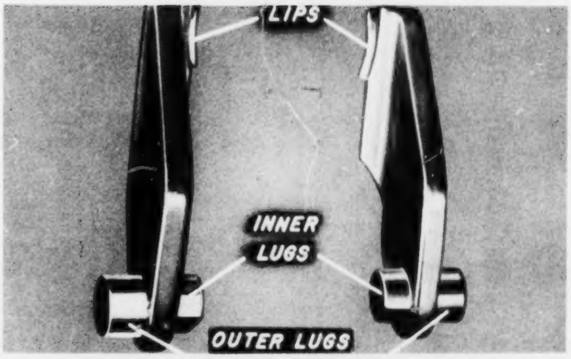


...by two extractors, located in the breech housing at either side of the breech block. These extractors serve two purposes: one is to latch the breech block in the lowered position.

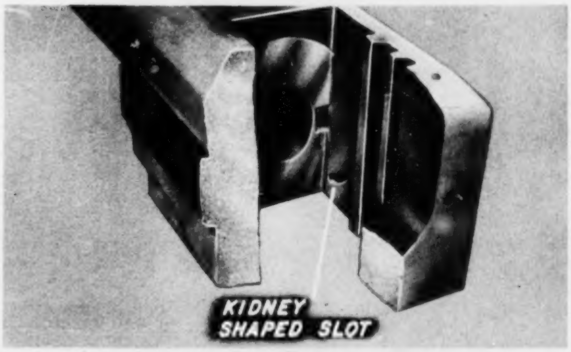


The other, which we shall study shortly, is to extract and eject the fired case from the gun.

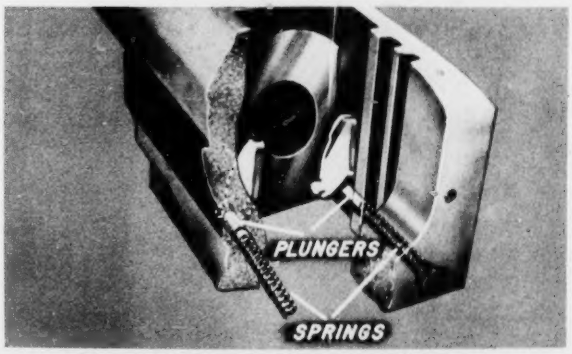



LIPS
INNER
LUGS
OUTER LUGS

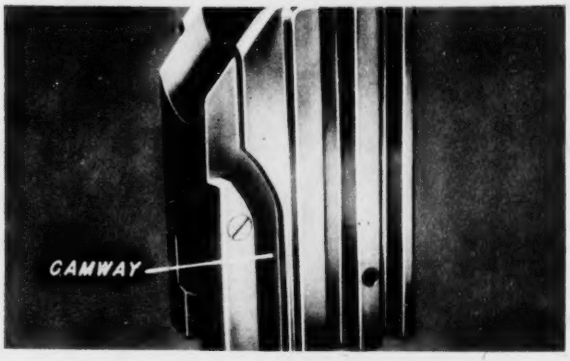
At the top of the extractors are lips to engage the rim of the cartridge case. At the bottom are inner lugs and outer lugs to provide for latching and unlatching the block.


KIDNEY
SHAPED SLOT

A kidney-shaped slot is cut in each side of the breech housing to receive the outer lugs and to permit them to ride fore and aft.

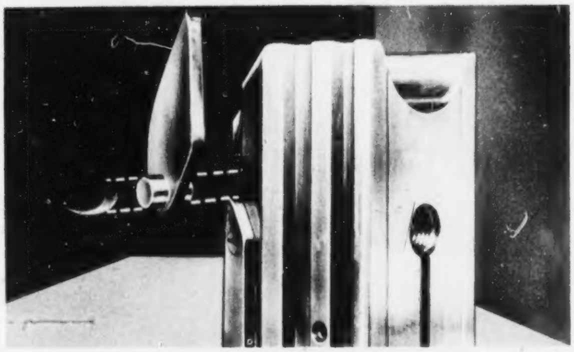

PLUNGERS
SPRINGS

Plungers and springs extend into the kidney-shaped slot to hold the extractor outer lugs forward. Each extractor inner lug . . .

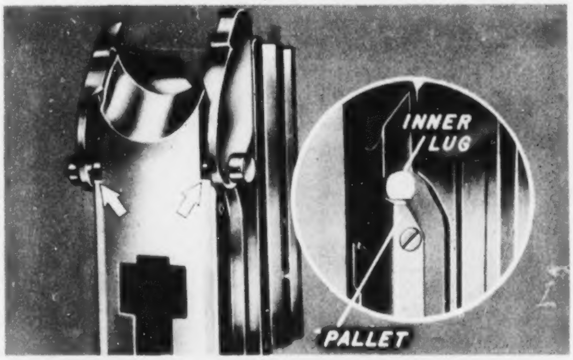


. . . fits into a cam way cut on each side of the breech plug.

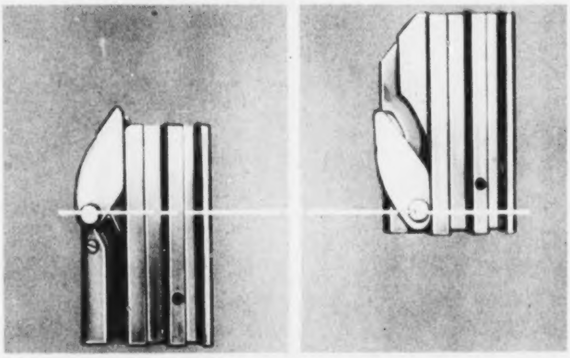
Here the artist has taken some liberties with the actual construction of the gun to show how a kidney-shaped slot in the breech housing receives the outer lug of an extractor and how the inner lug is received by a cam way in the breech block.



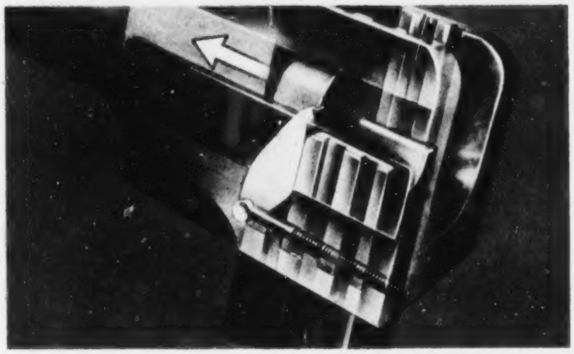
When the block is down the inner lugs of the extractors are seated on pallets at the top of the block's cam way. As shown in the insert each inner lug has a flat bottom surface and the top surface of each pallet is also flat. The lug resting on the pallet latches the block in the lower position.

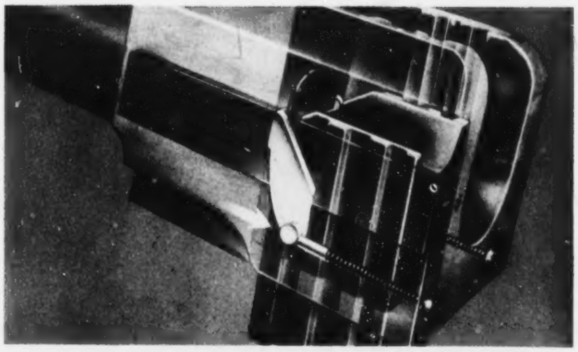


Now let's see how the block is unlatched. In the view at the left which shows the block in the lowered or latched position the inner lug is seated on the top of the pallet. At the right the extractor has been rocked by the cam way to a new position when the block is raised. This rocking is the only motion the extractors have as the block is lowered and raised.

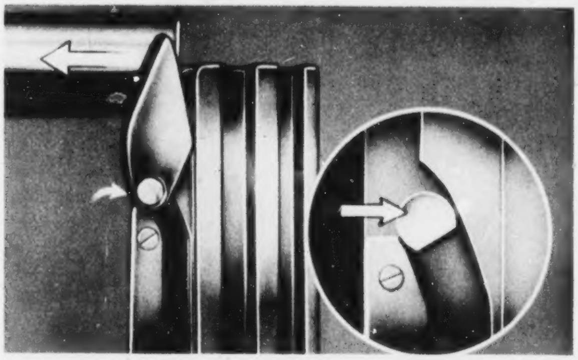


The ramming of a cartridge unlatches the block. The rim of the case strikes the lips of the extractors forcing them forward and rocking the extractors against the face of the breech.

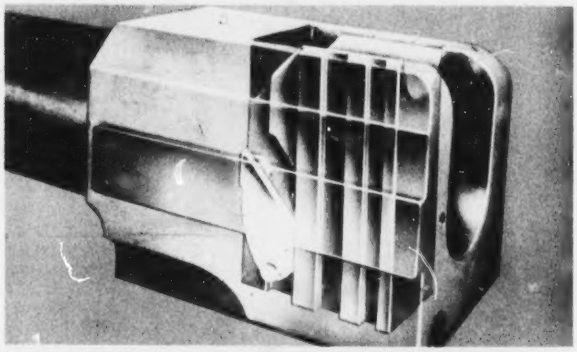




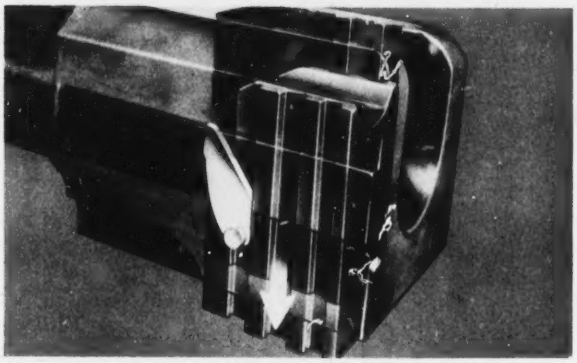
This moves the outer lugs aft in the kidney-shaped slots against the pressure of the spring loaded plunger.



As the rim of the case forces the extractor lips forward, the inner lugs are rocked off the pallets unlatching the block so that it may ride upward under the tension of the operating spring. In the insert is shown the manner in which a lug rides off a pallet.

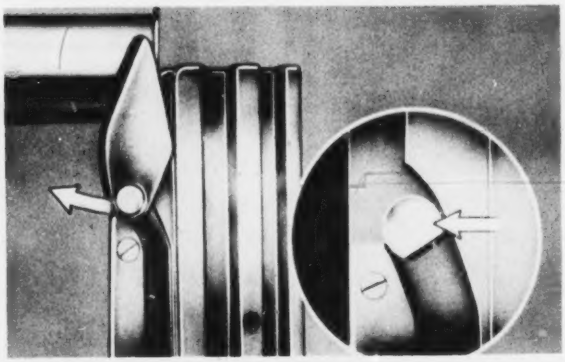


When the block is raised the lips of the extractors are forward, resting against the breech face and the outer lugs are aft. The gun can now be fired. Now for the second purpose of the extractors. That of extracting and ejecting the fired case.

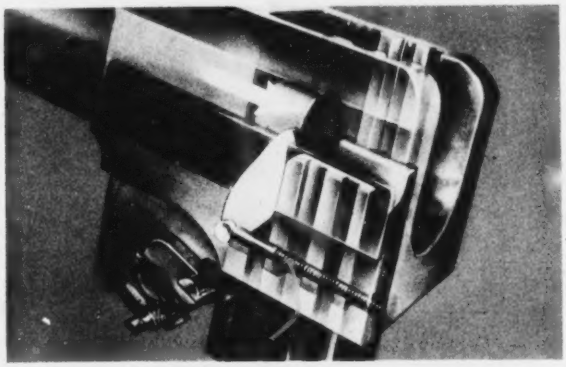


As the block is lowered after the firing of a round, the cam ways cut in its side ride over the inner lugs.

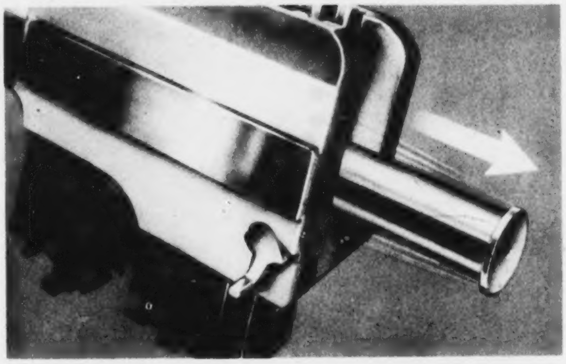
When the curved portion of the cam ways reach the inner lug, these lugs are cammed sharply forward...



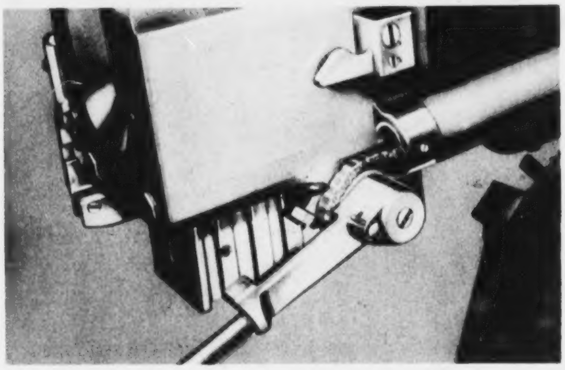
...throwing the extractor lips aft with such force that the fired case is extracted from the gun chamber



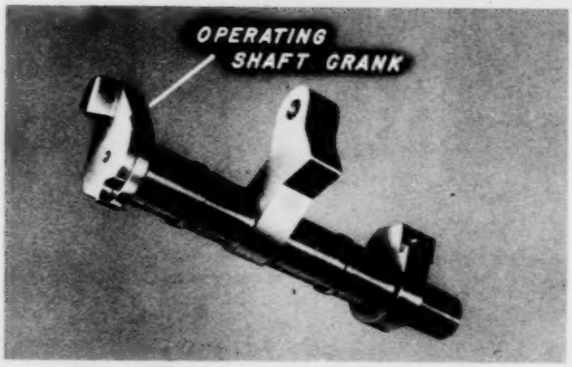
and ejected from the gun. This completes the action of the extractors in removing the fired case.



A moment ago we saw that the hand operating lever is used to lower the breechblock. This is the method employed in single fire operations.

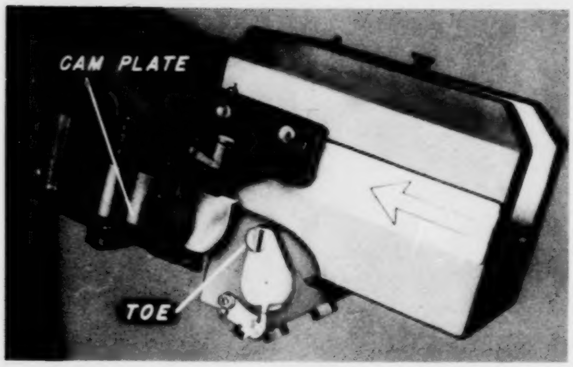


The gun is also designed for automatic fire, in which case the block is lowered automatically. Let's go into that now.



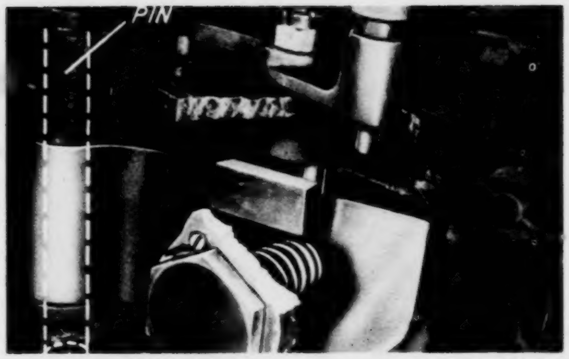
In automatic operations, an operating shaft crank at the left end of the operating shaft functions to lower the block.

This operating shaft crank is carried aft with the breech housing as the gun recoils after firing.

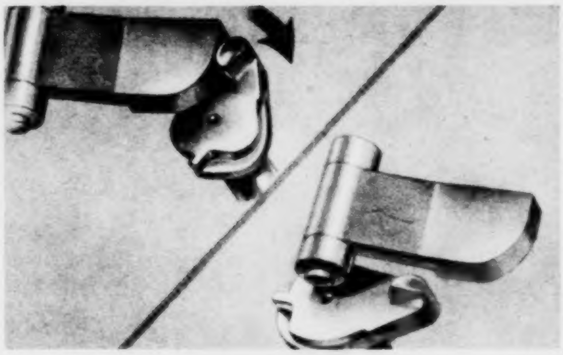


As the breech housing moves forward in counterrecoil, an operating shaft cam plate located on the cam slide plate is directly in the path of the toe on the crank. Let's examine this cam plate more closely.

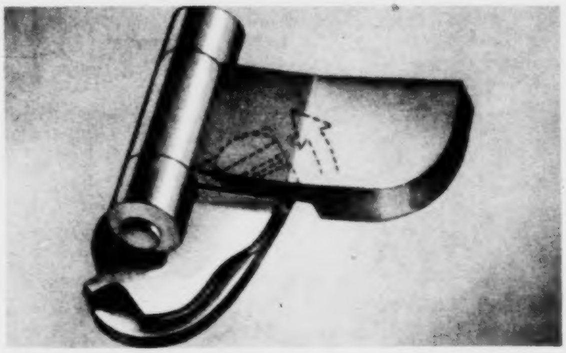
The cam plate pivots on a pin and its after-end is held inboard by a spring when the gun is in automatic operation. As the forward motion of counter recoil continues . . .



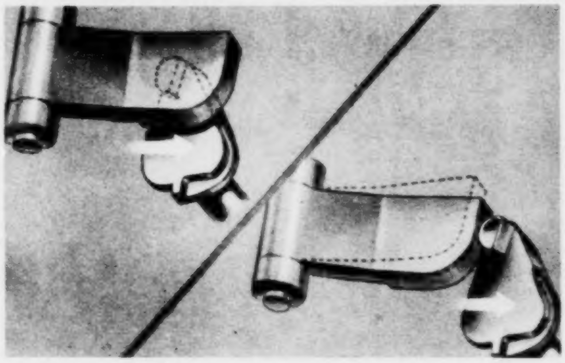
. . . the toe on the operating shaft crank strikes the cam plate and is cammed aft and down as shown at the left. This rotates the operating shaft and lowers the breech block. The view at the right shows the provision of the crank with the gun in full battery and the block down.

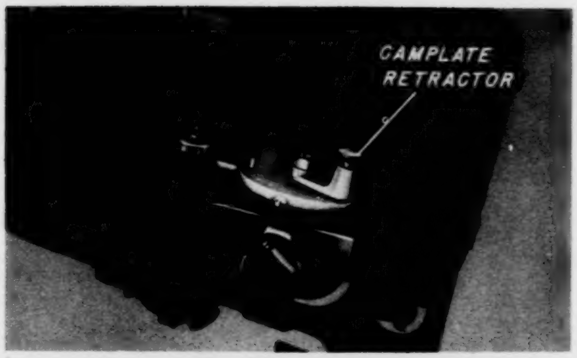


The toe snaps up behind the cam plate when the breech block is again raised with the loading of a new round.



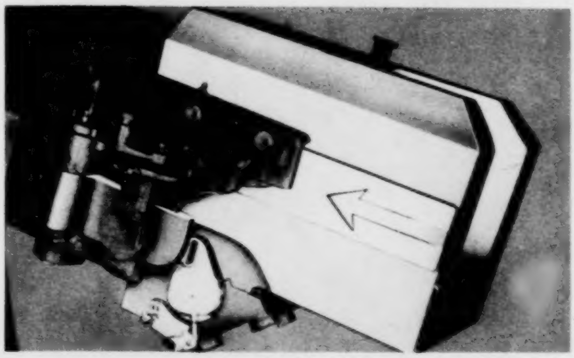
When the gun begins to recoil after firing as shown at the left the toe rides aft behind the cam plate. At the right we see how as the gun continues to recoil, the toe moves clear of the cam plate and the cam plate itself snaps inboard.



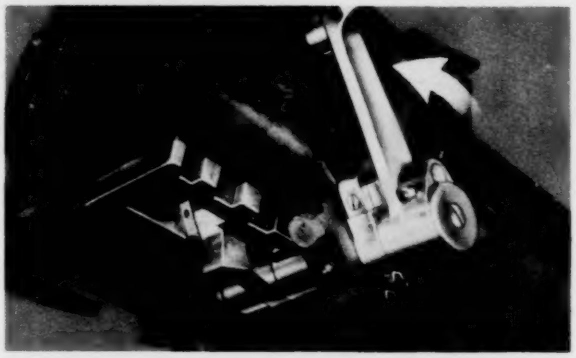


The actions just illustrated can take place only when the cam-plate retractor located on the cam slide plate is set to the A or automatic firing position.

When the retractor is set to the S or single fire position, the cam plate is held outboard against the pressure of its spring.

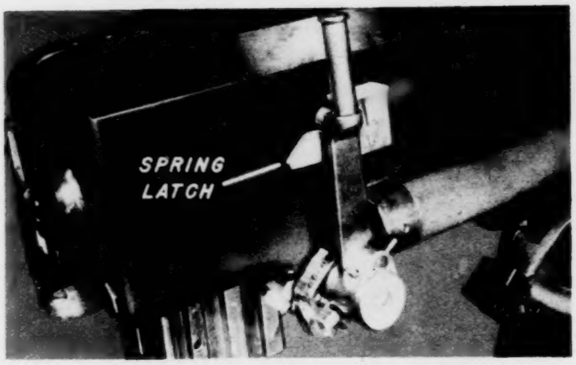


Then as the breech housing comes forward during counterrecoil, the toe on the operating shaft crank clears the cam plate and the operating shaft is not rotated. The gun will thus arrive in battery with the breech block still in the closed position. Opening of the breech...

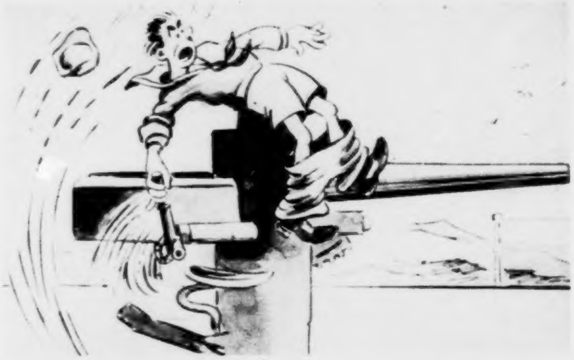


... must now be done manually by the hand operating lever. Since this must be repeated after the firing of each round, we have single fire operations.

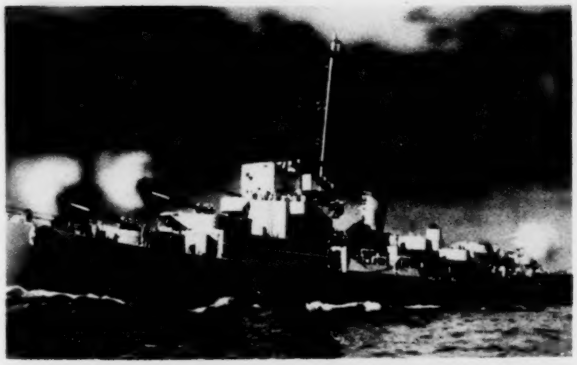
Right here we want to draw attention to the importance of this spring latch. After the manual opening of the breech, the hand operating lever must be returned immediately to its up position, where it is held securely by this latch. If this precaution is not observed...



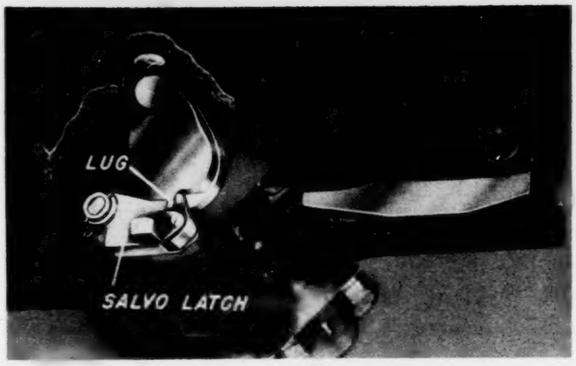
...the lever will be carried up violently as the gun is loaded and may cause serious injury to personnel and damage to the gun. The hand operating lever can be used at will, but there must be a means of preventing its use when the breech cannot be opened with safety.

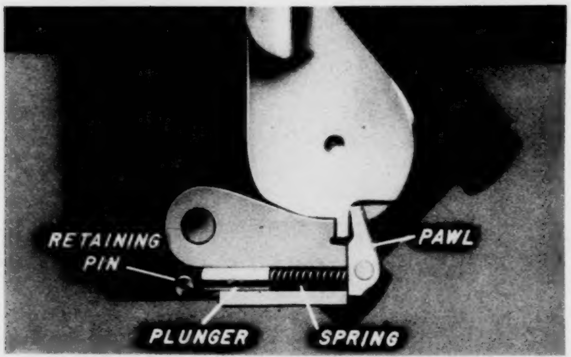


Such a situation could arise when a number of guns are fired together in salvo. Here a gun captain may fail to note whether or not his own gun recoils and counterrecoils proving that it has been fired. For all he knows a hang fire may be in progress. If it were, opening the breech would be dangerous. To prevent this, the gun is equipped with a safety device...

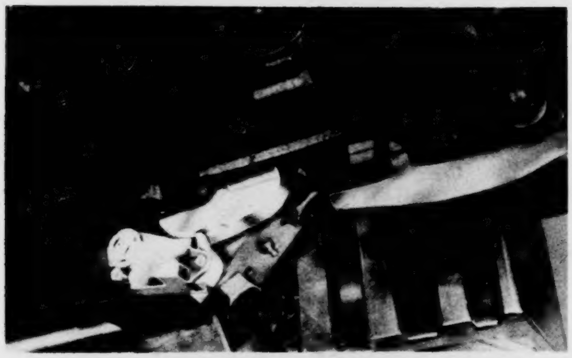


...known as a salvo latch. This latch is mounted on the breech housing and is in continual contact with the operating shaft crank. It latches a lug on the crank thus preventing rotation of the shaft and opening of the breech while an unfired round is in the chamber. Let's begin our study of the way this latching is accomplished by examining the construction of the salvo latch itself.

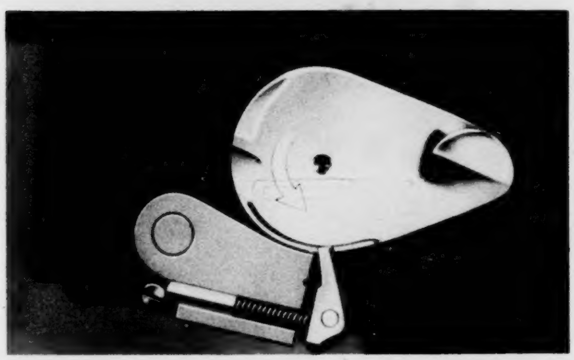




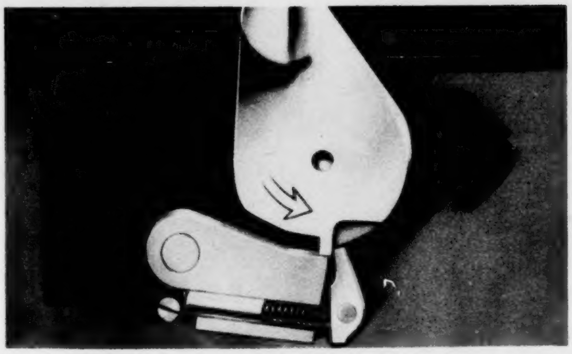
This latch is held upward in contact with the operating shaft crank, by a plunger and spring set within the latch below its pivot point. This plunger and spring push against a retaining pin attached to the breech housing and against the lower part of a pawl at the aft end of the latch. The action of the plunger and spring is to push the salvo latch upward and to hold the pawl forward.



When the block is down, the smooth edge of the crank bears on the salvo latch. Then, when a round is loaded and the operating shaft is rotated to raise the block...

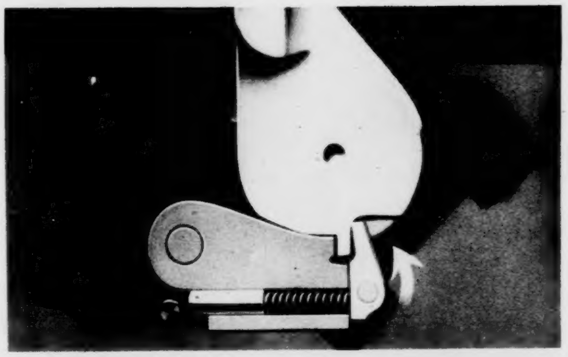


...the crank rotates with the shaft and its smooth edge rides over the top surface of the salvo latch.

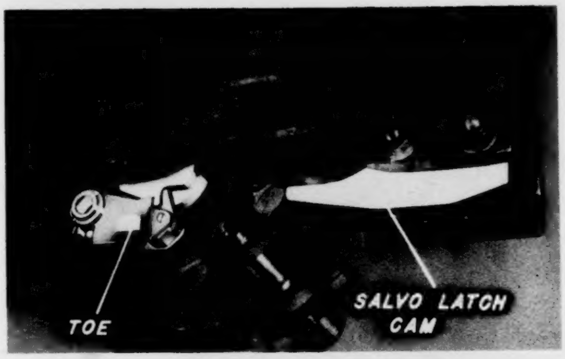


As the operating shaft nears the end of its location, the lug on the crank strikes the pawl, then the lug pushes the pawl aft and finally rides off the shoulder of the salvo latch.

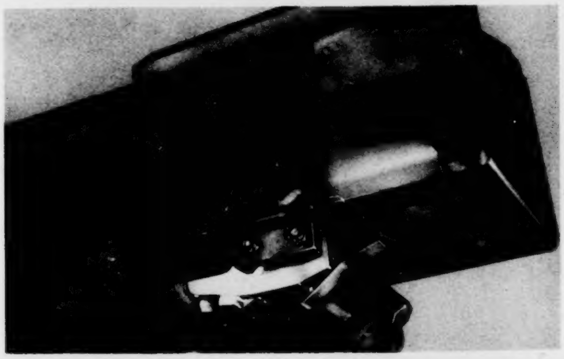
The salvo latch then rises and the lug fits into a recess forward of the pawl. The shaft, now at the end of its counterclockwise rotation, cannot be rotated clockwise to open the breech, because the body of the latch prevents movement of the lug. The block is now latched in its up position and the gun is ready for firing.



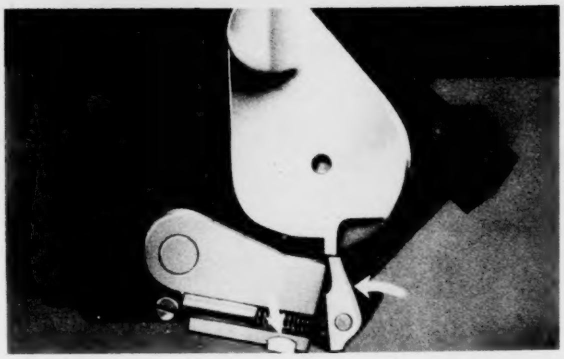
The block can be unlatched only by pushing the salvo latch down by means of its toe. When the gun recoils after firing, the pushing down is done by a salvo latch cam secured to the after end of the cam slide plate.



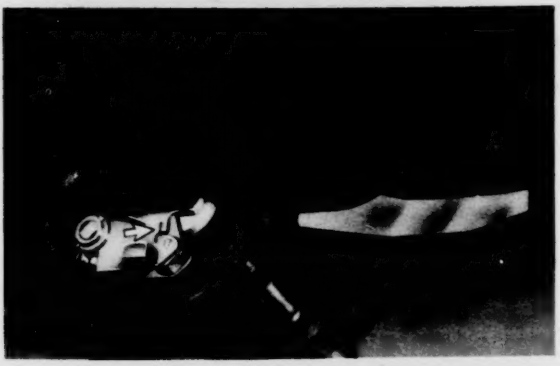
In recoil the toe is carried under the salvo latch cam. When this occurs



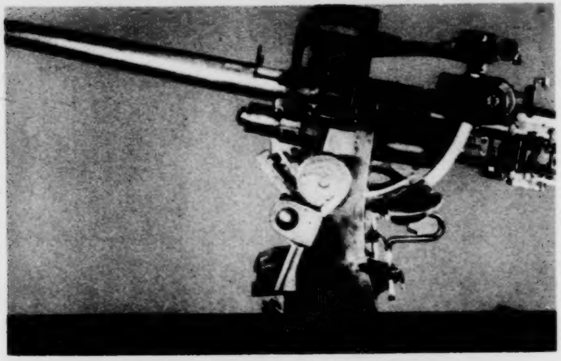
the latch is pulled down and the crank lug is no longer engaged. The pawl then snaps shut preventing the lug from re-entering the recess.



Thus when the gun arrives back in battery, the operating shaft can be rotated to lower the block for the loading of another round.

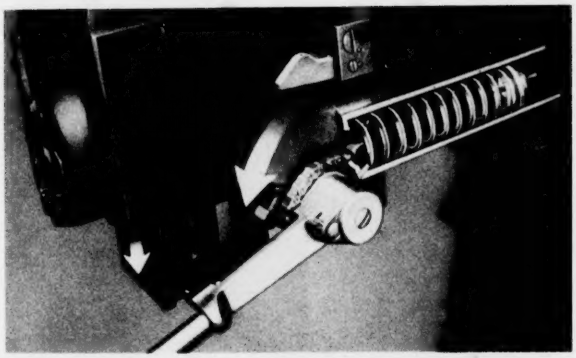


If the gun had failed to fire, the block would have remained in the up position with the operating shaft latched. This is because the gun had not recoiled and the salvo latch therefore had not been tripped by the cam.

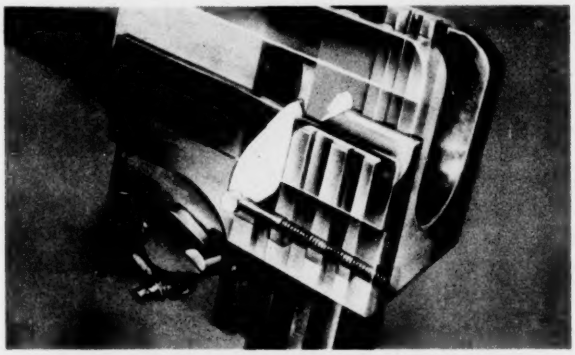


We'll see the salvo latch again, together with all the other features of the 3"/50 breech mechanism as we describe its operation in automatic fire and in single fire. First we'll describe an action that is the same in automatic and single fire: the loading of the first round.

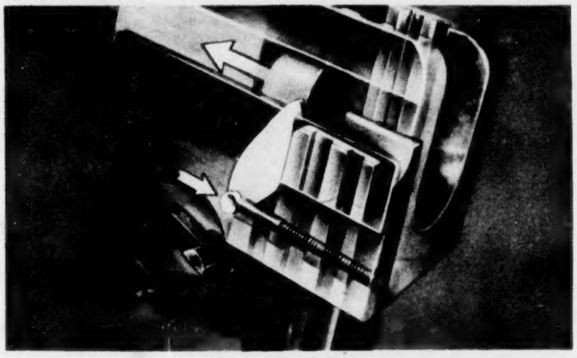
The loading of the first round requires that the salvo latch be tripped manually so that the breech can be opened



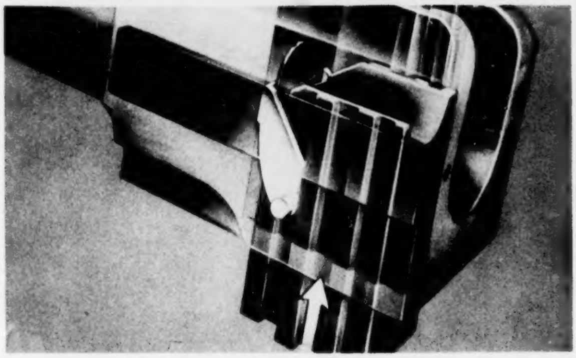
by the hand operating lever. As the block travels downward, the operating spring is compressed.



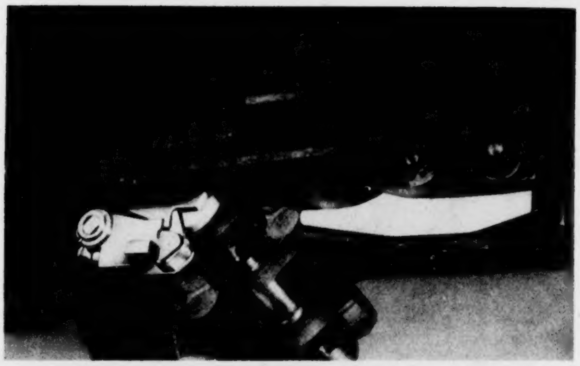
When the block is down all the way, it is latched by the extractors. We are now ready to load the first round.



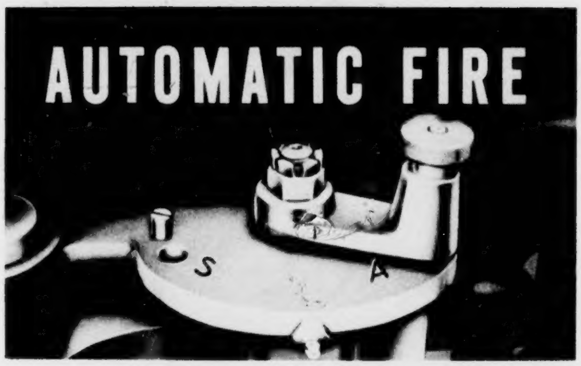
As the gun is loaded, the rim of the case forces the extractor lips forward and the extractor lugs aft.



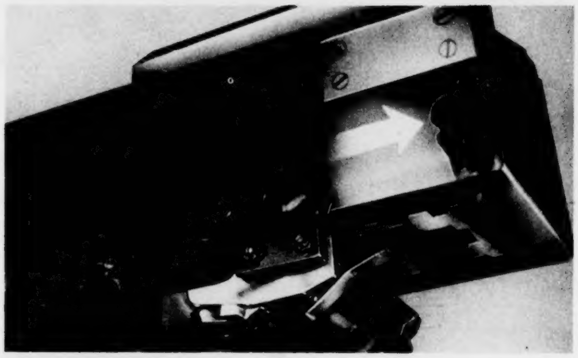
The inner lugs ride off the pallet permitting the block to be moved upward under the power stored in the compressed operating spring.



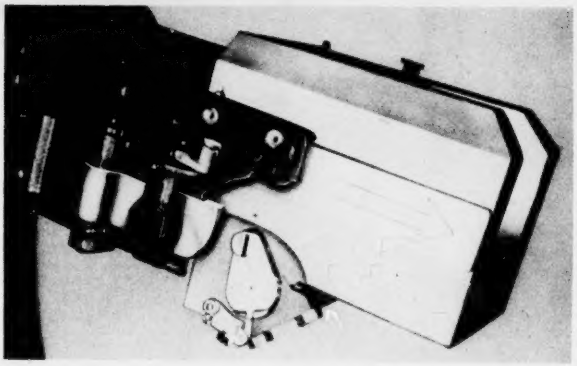
As the closing of the breech is completed, the lug on the operating shaft crank is latched by the salvo latch. The gun is now loaded and the breech is locked. We are ready to fire.



Assuming that we intend to operate in automatic fire, which is the normal and preferred method, the cam plate retractor has been set at A punching the operating shaft cam plate to its inboard position.

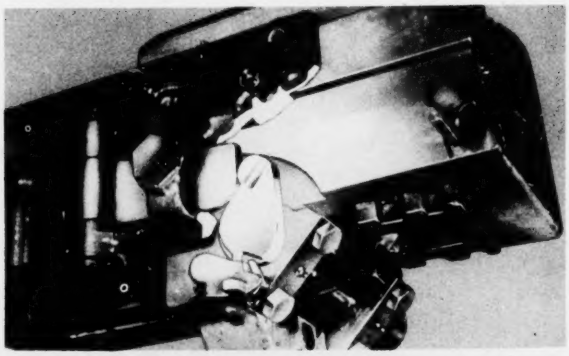


When the gun recoils after firing, the breech housing carries the salvo latch aft until its toe rides under the salvo latch cam. This trips the salvo latch to permit lowering the block during counter recoil.

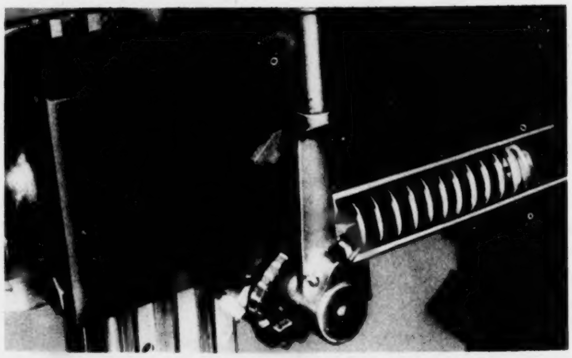


As recoil continues, the toe on the operating shaft crank pushes the operating shaft cam plate outboard against its spring. The toe then rides clear of the cam plate which is pushed inboard by its spring.

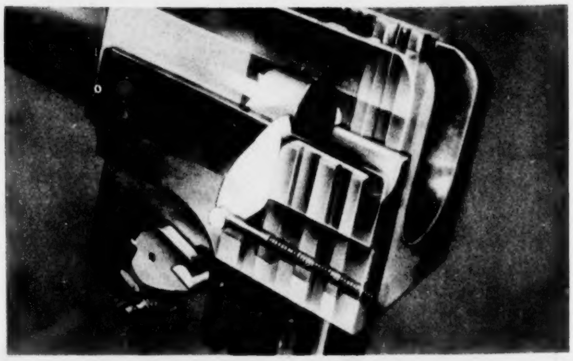
After the gun starts forward in counterrecoil the toe of the operating shaft crank engages the cam plate and is cammed down and aft rotating the operating shaft to lower the breech block...



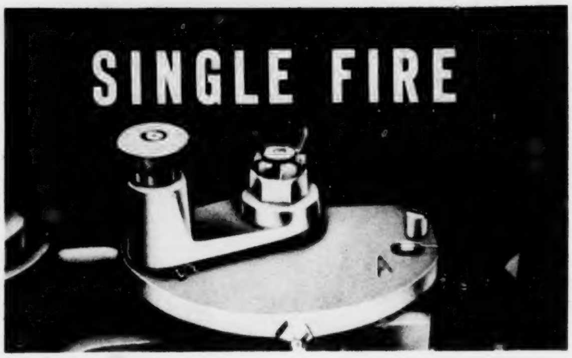
...and compressing the operating spring.

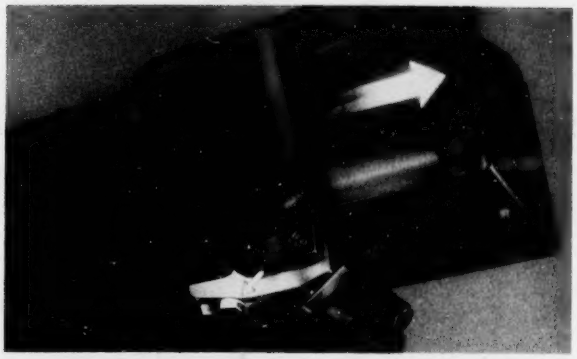


The extractor lips now move sharply aft to extract and eject the fired case. At the same time the extractor inner lugs are cammed forward until they seat on the pallet to latch the block down. This completes the cycle of automatic fire. Now let's observe the cycle of single fire.

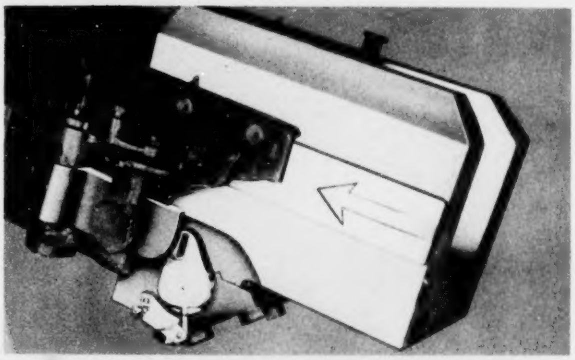


The gun is set for single fire operation by moving the cam plate retractor to S. This forces the operating shaft cam plate to an outboard position, in which it is entirely clear of the crank toe at all times.

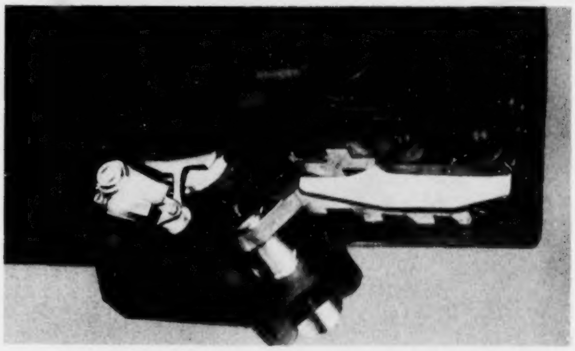




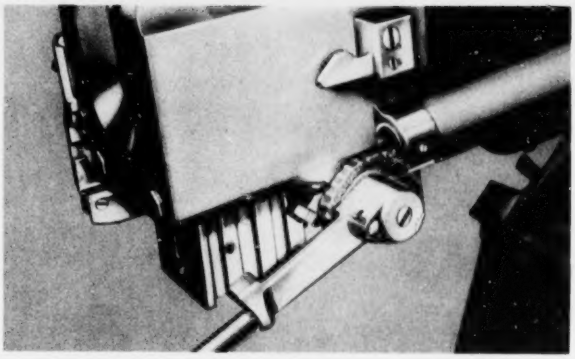
After firing, as the gun travels aft in recoil, the salvo latch is tripped by the salvo latch cam.



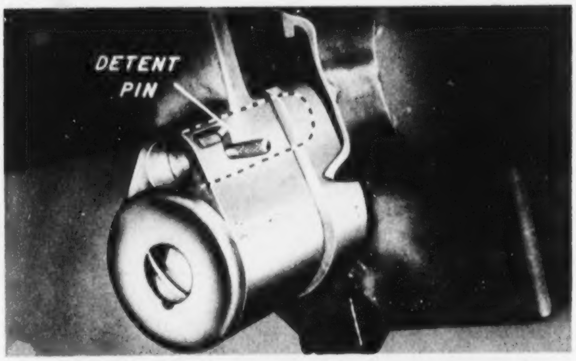
As the crank toe moves forward with the gun in counterrecoil, it cannot engage the operating shaft cam plate; consequently, it is not cammed around as in automatic fire



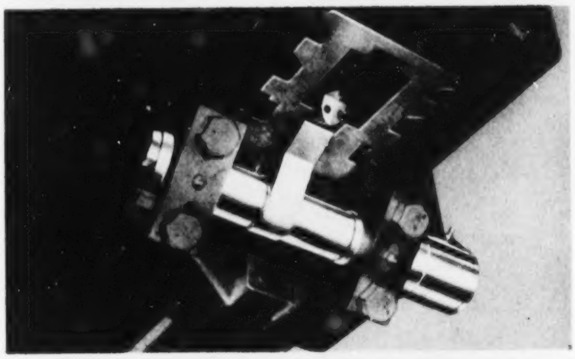
but arrives at the end of its forward movement still in the position in which it was when the gun was fired. This means that the gun has come back to battery with the breech closed but with the salvo latch tripped.



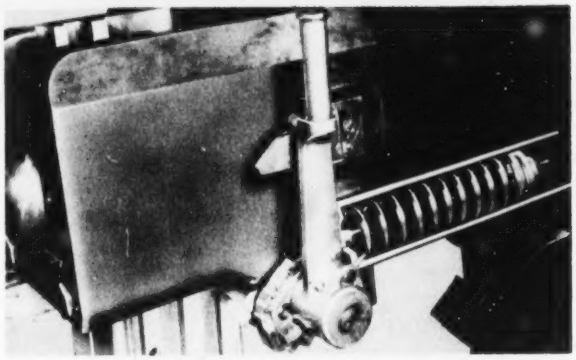
The hand operating lever must now be used to lower the plug for the ejection of the fired case and the loading of another round. This operating lever can also be used to raise the breech block if the operating spring is not functioning. To arrange for this a knurled detent pin must be moved to an inboard position. This causes the spring plunger in the lever to engage a hole in the crank arm of the operating shaft. The operating shaft may now be rotated by the lever to raise the block without the help of the operating spring.



That's the story of the breech mechanism 3"/50 caliber gun. It is a rugged but precisely made mechanism. Because its parts fit so closely all surfaces must be kept clean and well lubricated. Dirt, burrs or foreign matter in these close fitting parts can easily stop the action of the mechanism.

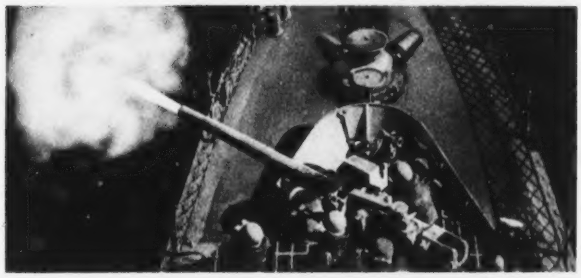


In combat areas it is common practice to keep the breech plug lowered ready for immediate action. This may weaken the operating spring. To prevent casualties resulting from a faulty operating spring the tension of the spring should be tested and adjusted regularly.



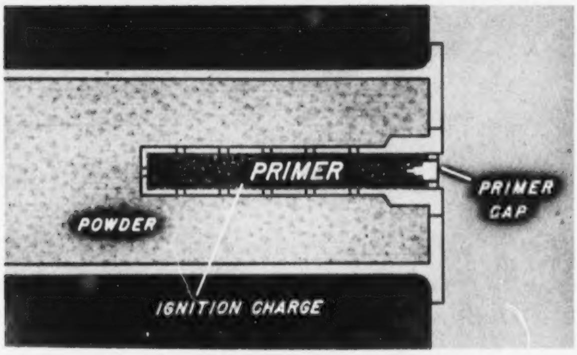
Although the 3"/50 caliber gun is designed to provide a high rate of fire it can be no more efficient than its breech mechanism. Therefore it is vitally important to maintain this mechanism so that it will operate automatically and continuously, whenever and for as long as it is needed.

FUNCTION OF THE FIRING MECHANISM

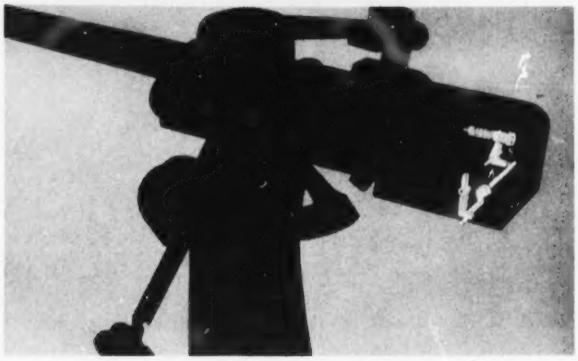


Like any other gun, the 3"/50 is fired by igniting a powder charge. This principle of firing is centuries old.

But, to the old time gunner, firing a gun wasn't the split-second operation it is nowadays. He had to carry fire to his powder charge in the form of an open flame or a piece of glowing punk. He lit the fuze which slowly burned down to explode the charge and drive the projectile out through the gun. Slow? Yes - but fast enough for the targets of sailing-ship days. There's nothing slow about the firing of a gun in which the igniting elements are loaded into the gun chamber with each round.



The igniting elements of the 3"/50 cartridge are contained in a primer in the cartridge case. A primer cap explodes an ignition charge, which applies fire to the powder. Practically instantaneous firing is made possible...

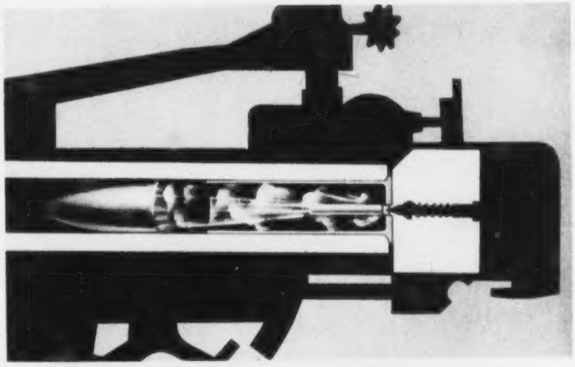


...by a firing mechanism, which sets off the primer cap at almost the same instant the pointer wills to fire.

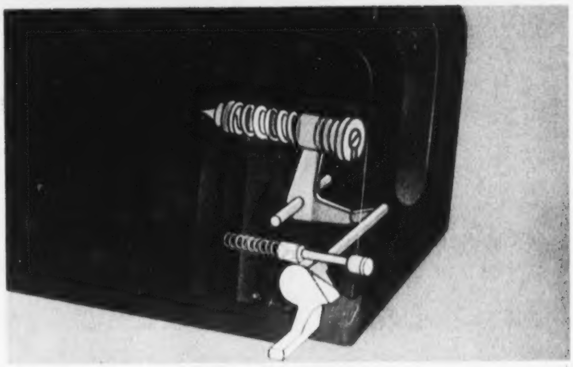
When the pointer squeezes a firing key, electricity, fastest impulse known to man, causes the firing mechanism to operate. Should this usual and preferred method fail to fire the gun, the pointer...

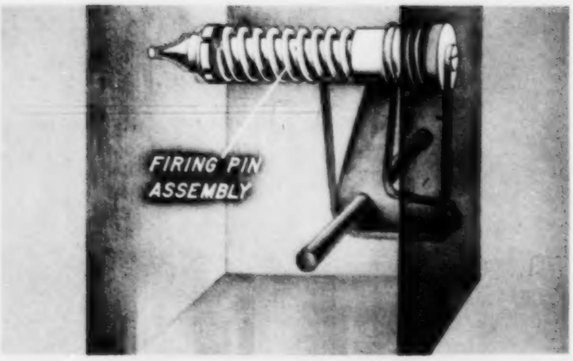
...depresses a foot firing treadle with his right foot to operate the firing mechanism through a mechanical linkage. Either control system, mechanical or electrical...

...causes firing of the gun by percussion. A firing pin is driven against the primer of the cartridge to explode the powder charge. The firing pin is operated...

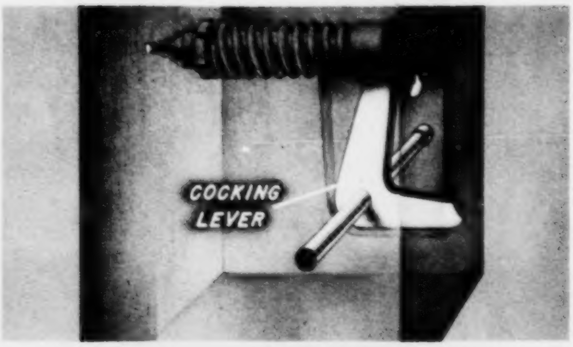


...by the firing mechanism, located in the breech block and breech housing. This mechanism includes...

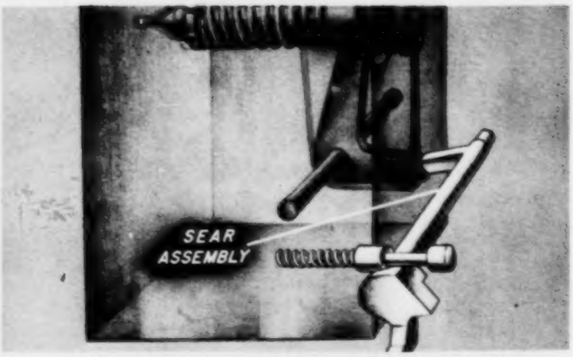




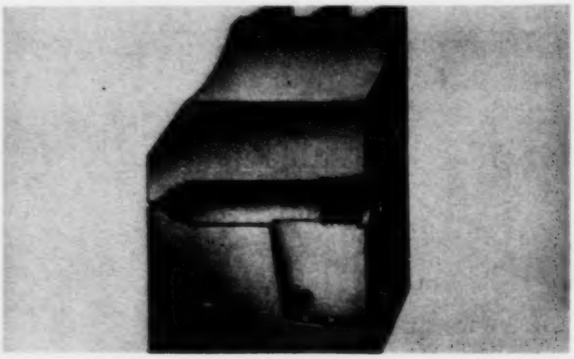
...a firing pin assembly which causes the firing pin to travel forward and strike the primer.



A cocking lever cocks and releases the firing pin assembly. The cocking lever and the firing pin assembly are both located in the breech block.

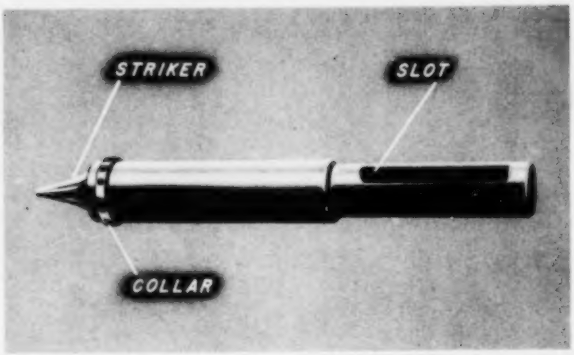


A sear assembly mounted in the breech housing operates the cocking lever, causing it to cock and release the firing pin assembly...

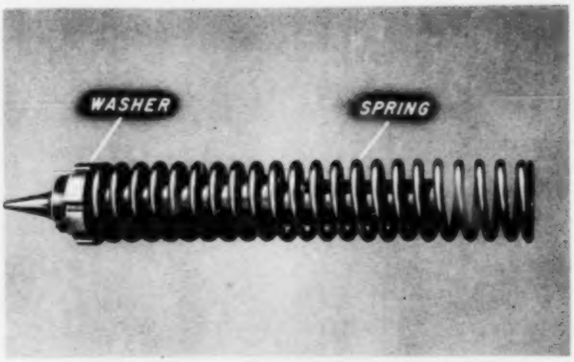


...which is housed in a hole in the breech block. This hole is tapered at the forward end, and terminates in a small opening that permits the end of the firing pin to come through and strike the primer.

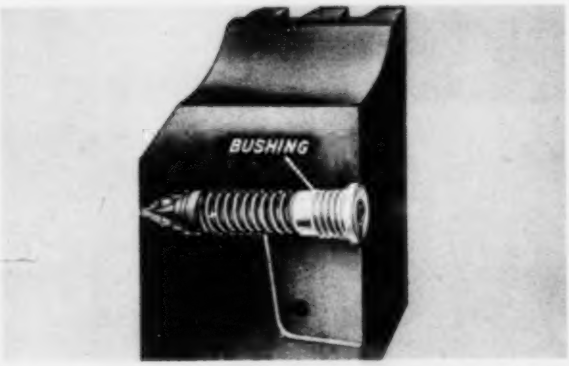
A hardened point known as a striker is at the forward end of the firing pin. Aft of the striker is a collar. A slot is cut in the after section of the firing pin...



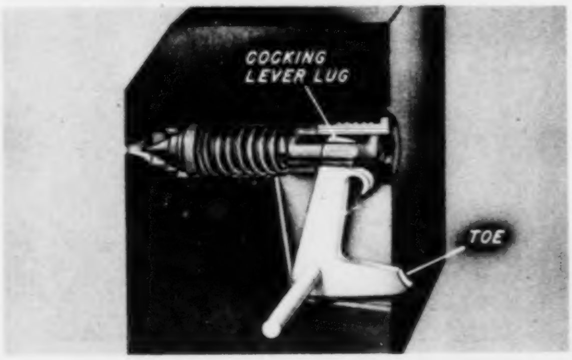
...aft of the collar is a firing pin washer, which fits snugly over the pin. A firing pin spring bears against the washer and extends aft...

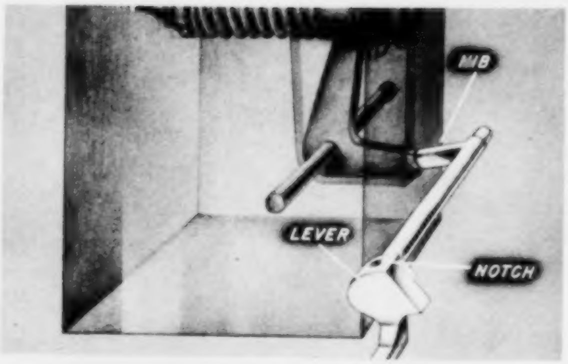


...to against a bushing screwed into the after end of the breech block. This bushing has a slot cut lengthwise in its underside.

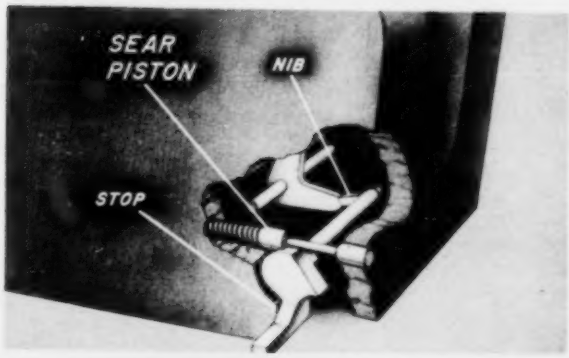


A cocking lever lug on the upper arm of the cocking lever is fitted into the firing pin slot and bushing slot. This lug draws the firing pin to the rear when the cocking lever rotates on its pivot pin in the base of the breech block. A toe on the lower arm of the cocking lever...

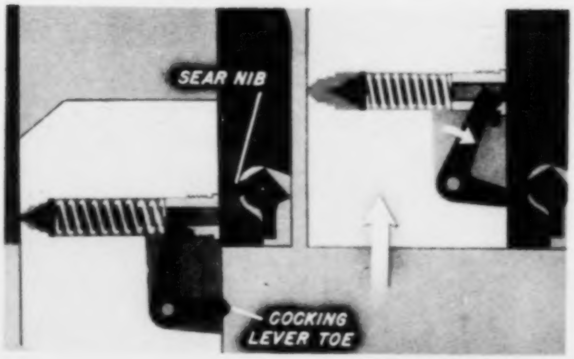




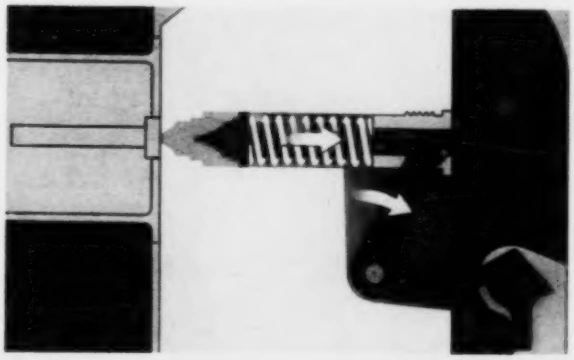
. . .contacts a nib on the inboard end of the sear. The sear has a lever on its outboard end. On the top side of this lever is a notch that acts as a seat. . .



. . .for a sear piston, which is pushed aft by a spring to hold the sear nib in its normal "up" position. This "up" position of the sear nib is determined by a stop on the breech housing, which limits clockwise movement of the sear. Now that we have seen all the parts of the firing mechanism located in the breech block and the breech housing, let's see how these parts operate

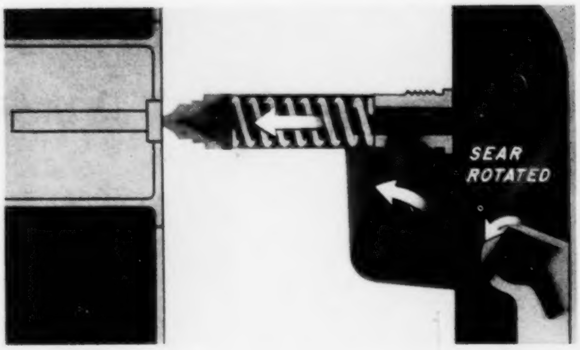


At the left we see the positions of the sear nib and the cocking lever toe when the breech block is in the lowered position. When the breech block is moved to the raised position, shown at the right, the cocking lever toe strikes the sear nib, which prevents it from rising with the block. This causes the cocking lever to pivot on its pin, carrying its upper arm aft. . .

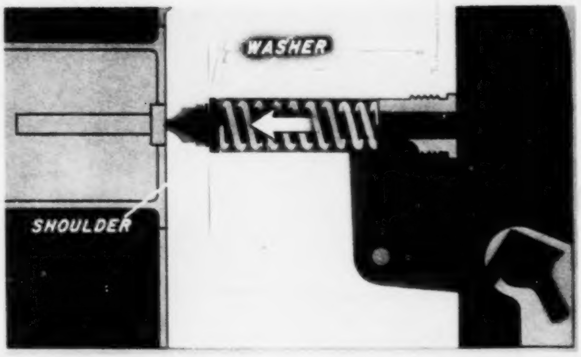


. . .and pulling the firing pin back to the cocked position. This compresses the firing spring between the washer and the bushing to provide the power. . .

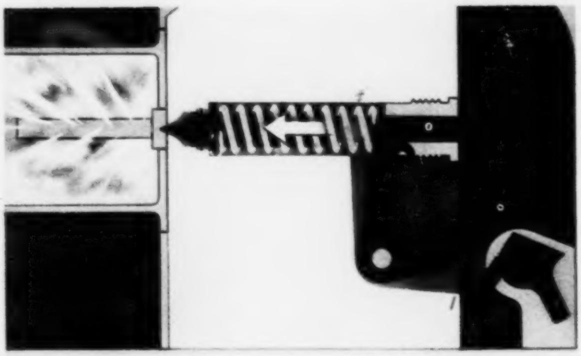
. . .which drives the firing pin forward when the sear is rotated. The rotation of the sear releases the cocking lever and permits the firing spring to drive the firing pin forward. . .



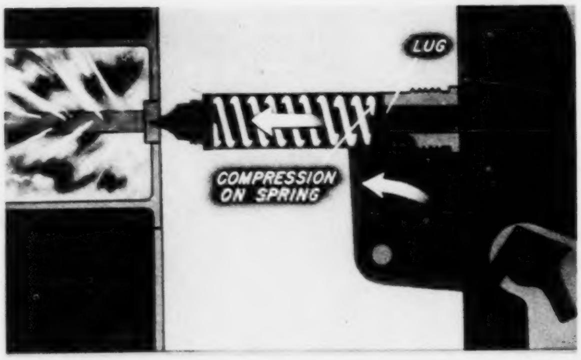
. . .until the washer against which the spring bears is stopped by a shoulder in the breech block. At the same time, the firing pin. . .

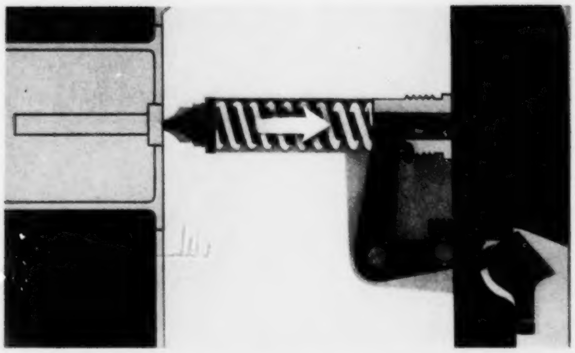


. . .continues ahead on its own momentum and darts through the small hole to strike the primer and fire the gun.

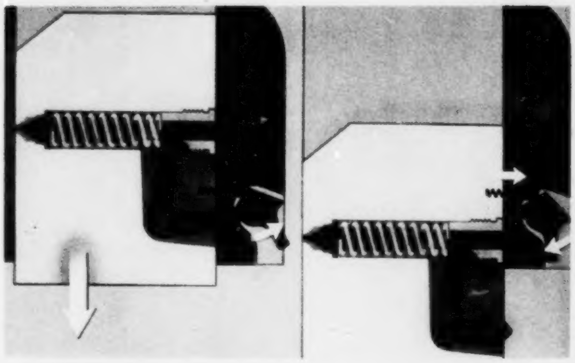


As the pin darts through the hole, it carries the cocking lever lug forward, so that the lug exerts a slight compression on the spring.

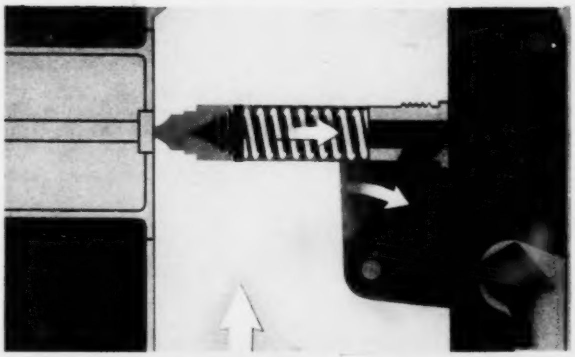




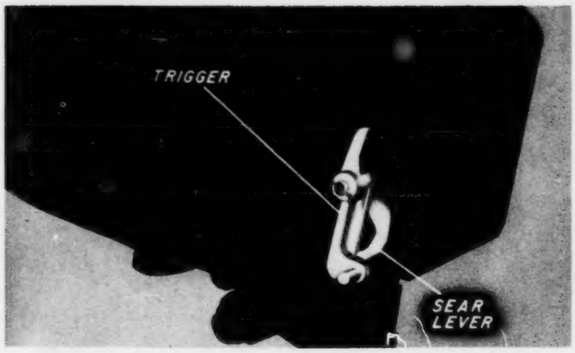
The compressed spring then pushes the cocking lever lug back against the end of the firing pin slot, thus retracting the striker point back flush with the face of the block. This prevents the striker point from being sheared off as the block is lowered to extract the fired case. At the same time these movements of the firing pin and cocking lever occur, the sear nib is carried back to the "up" position by its piston and spring.



While the block is being lowered, after firing, as shown at the left, the sear nib is again pressed down by the cocking lever toe. After the toe has passed it, as shown at the right, the sear nib is returned by its piston and spring to the normal "up" position. . .

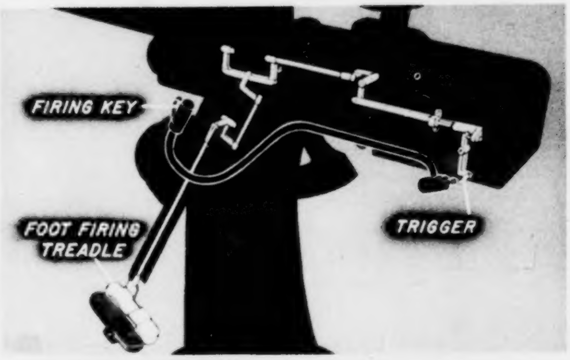


. . .and cocks the firing pin as the block is raised for the firing of another round. We're ready now to see how the sear is rotated to cause firing of the gun.

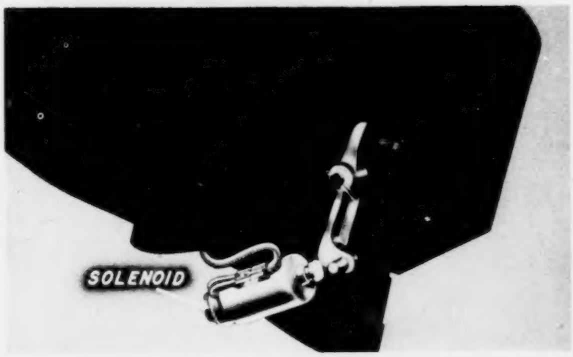


A trigger pivoted on the cam slide plate engages the sear lever. Thus the sear is rotated when the trigger is moved aft.

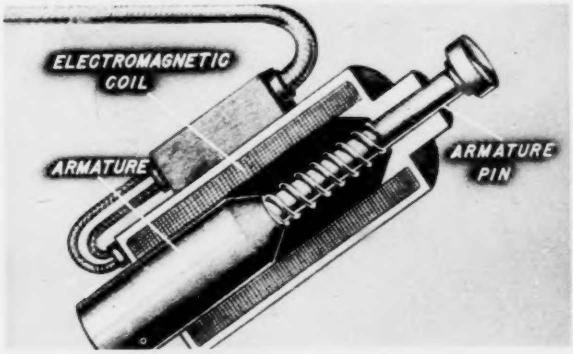
A firing key or a foot firing treadle at the pointer's station actuates the trigger. The firing key controls an electro-magnetic system, shown in black; the foot firing treadle a mechanical system, shown in white. The electro-magnetic is the usual and preferred system, because it is faster.



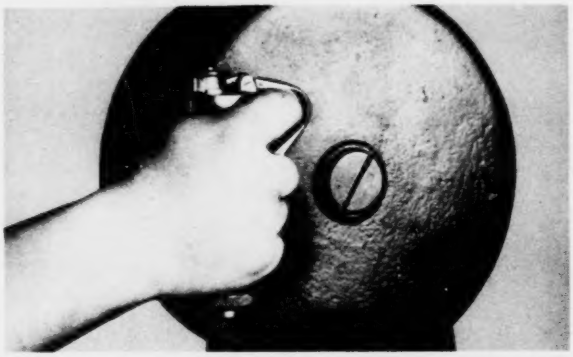
A solenoid mounted on the cam slide plate operates the trigger electrically.

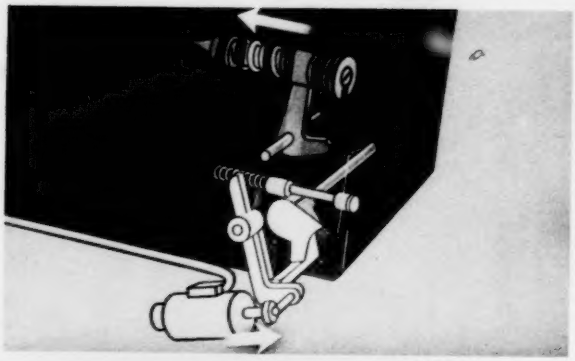


This solenoid is an electro-magnetic coil around an armature that is free to move an armature pin against the pressure of a light spring. Electrical current flows through the coil. . .

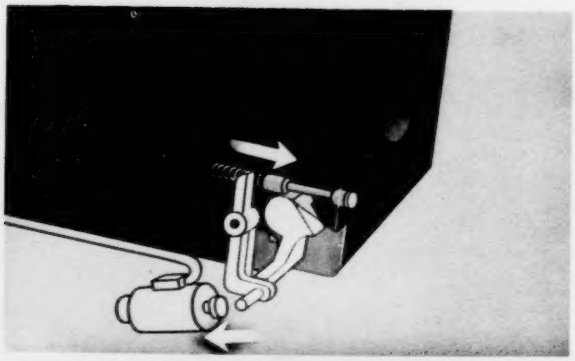


. . .when the pointer squeezes his firing key. Holding the firing key closed while the breech block is rising will result in failure to cock the firing pin. The firing key should be released immediately after firing, as holding it closed for even a few minutes will overheat and ruin the solenoid coil (except guns equipped with solenoids MK 14 MOD 1 or MK 28 will fire on breech closure when either the firing key or foot treadle is actuated).

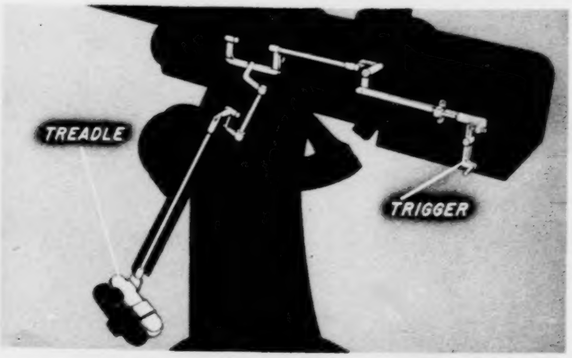




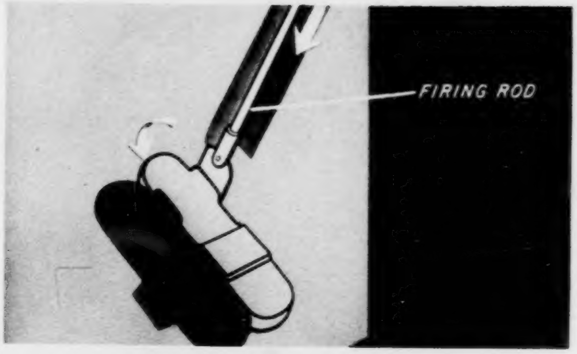
Electrical current passing through the solenoid coil drives the armature pin aft to strike a lug on the trigger, and cause the gun to fire. When the current ceases to flow. . .



. . .the armature pin is returned to its "in" position by the solenoid spring. At the same time the trigger is returned to its normal position by the sear piston and lever. The system is now ready to be operated again by another electrical impulse. If the electrical system should fail. . .

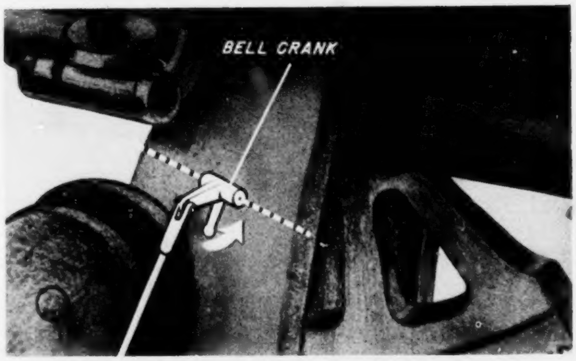


. . .the foot firing treadle under the pointer's right foot is used to operate the trigger by a linkage of rods and levers. Let's take a look at this linkage. Connected to the foot firing treadle. . .

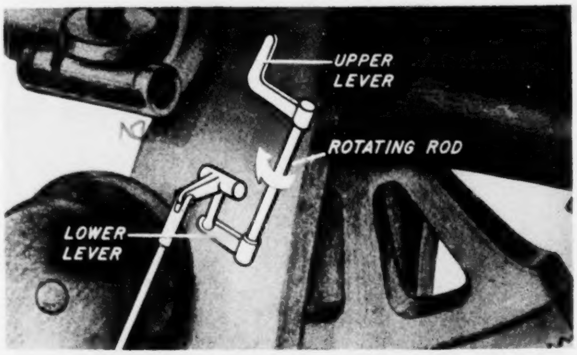


. . .is a firing rod which is pulled down when the treadle is depressed. This rod extends up the carriage cheek. . .

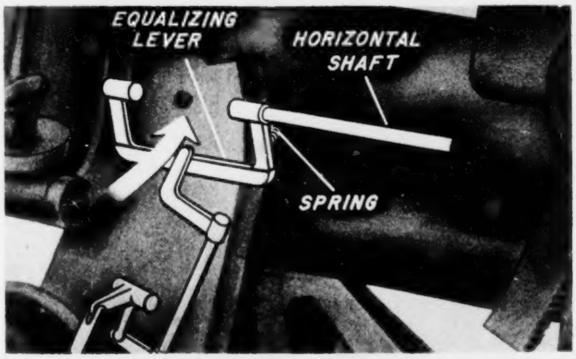
. . .to connect with a bell crank mounted on the inner side of the cheek. The bell crank pivots on its bearing when the firing rod is pulled down. As the lower arm of the bell crank pivots inboard. . .



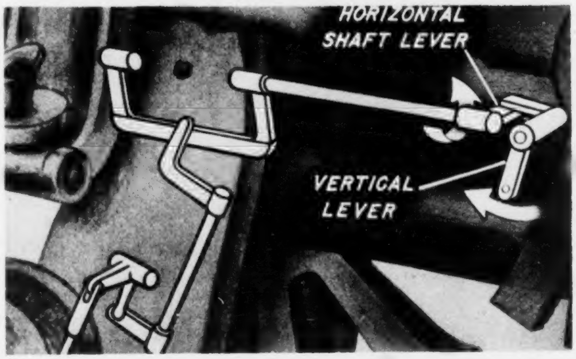
. . .it pushes against a lower lever to turn a rotating rod. An upper lever on the rotating rod is thus thrust inboard. . .

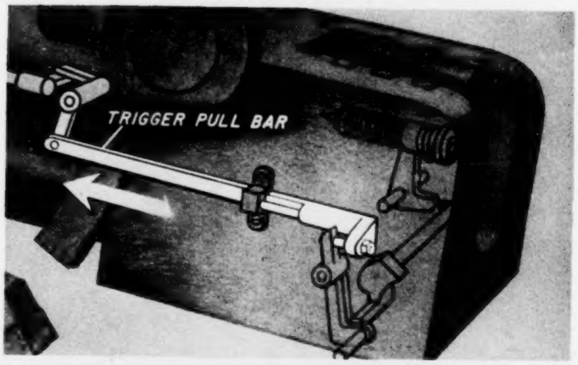

UPPER LEVER
ROTATING ROD
LOWER LEVER

. . .against an equalizing lever to which is secured a horizontal shaft. The equalizing lever is mounted on the slide around the left trunnion to provide contact with the upper lever on the cheek at any elevation or depression of the gun. The equalizing lever is thrust inboard against spring pressure when the foot firing linkage is operated. The horizontal shaft. . .

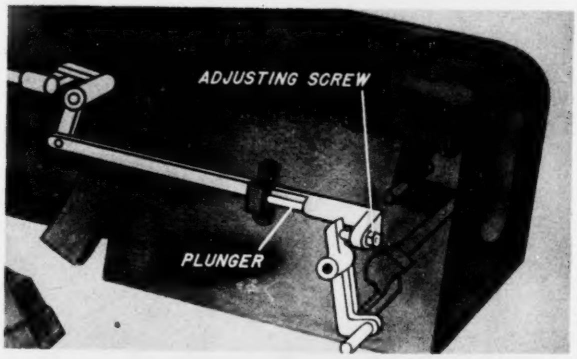

EQUALIZING LEVER
HORIZONTAL SHAFT
SPRING

. . .terminates in a horizontal shaft lever. This horizontal shaft lever is rotated to raise the inner arm of a "vertical lever" which pivots on the slide. The inner arm rotates the "vertical lever", causing its outer arm to move forward. To this outer arm. . .

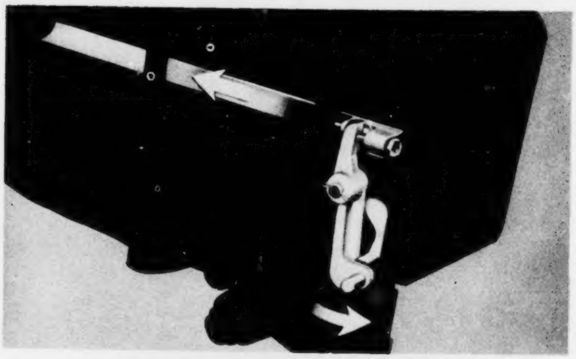

HORIZONTAL SHAFT LEVER
VERTICAL LEVER



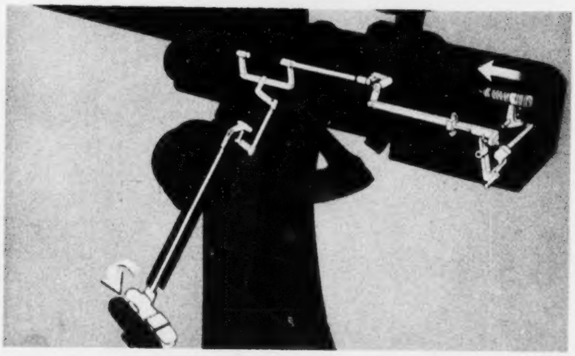
. . .is connected a trigger pull bar, which is pulled forward when the foot firing linkage is operated.



An adjusting screw at the after end of this trigger pull bar contacts the upper arm of the trigger. A spring loaded plunger holds the bar in its normal aft position.

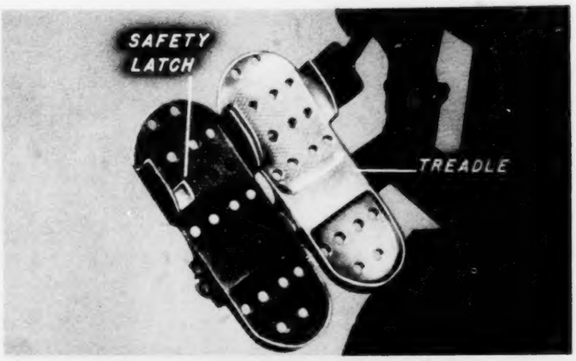


When the trigger pull bar is carried forward by the foot firing linkage, it rotates the trigger to fire the gun.

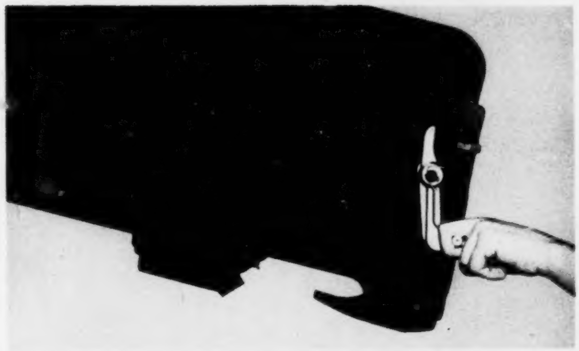


Here is the complete linkage which operates in mechanical firing. The foot treadle should be released immediately after the gun fires, in order that the firing pin will cock properly on the next load (except on guns equipped with solenoids MK 14 MOD 1 or MK 28 will fire on breech closure when the foot treadle is held depressed).

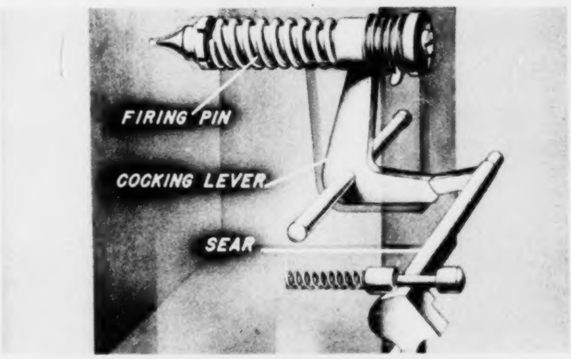
A safety latch locks the treadle in its normal "up" position. This latch, operated by a spring, is controlled by a lug on the left foot rest. When the pointer's left foot is in place on the rest, the latch is released, freeing the treadle for use.



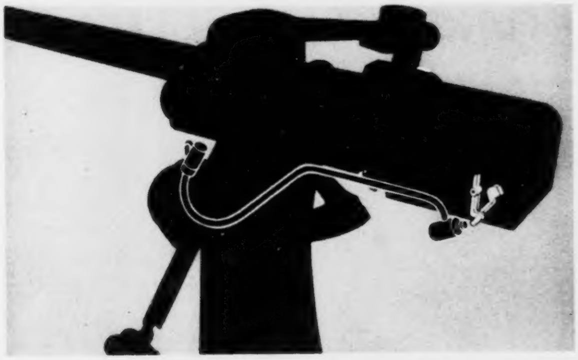
The gun may be fired from the after end by pulling back the trigger. This method is employed only when the firing mechanism fails to respond to the pointer's firing key and foot firing treadle. This completes the description of the firing mechanism of the 3"/50, caliber gun. Let's review briefly some of the points we have covered.

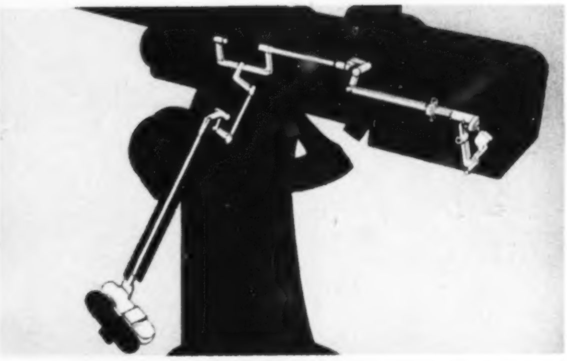


We have learned that a firing pin and a cocking lever are located in the breech block. The cocking lever is operated by a sear located in the breech housing. After the firing mechanism has been cocked. . .

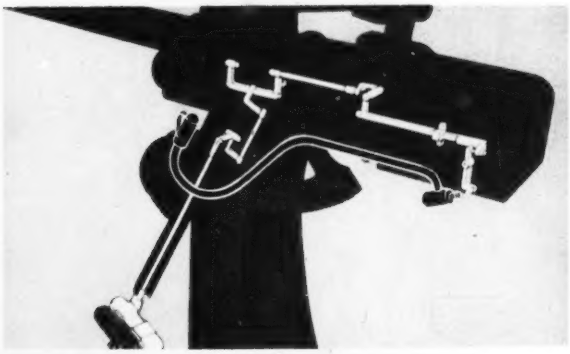


. . .the gun is fired from the pointer's station by an electrical firing key which actuates a solenoid. . .

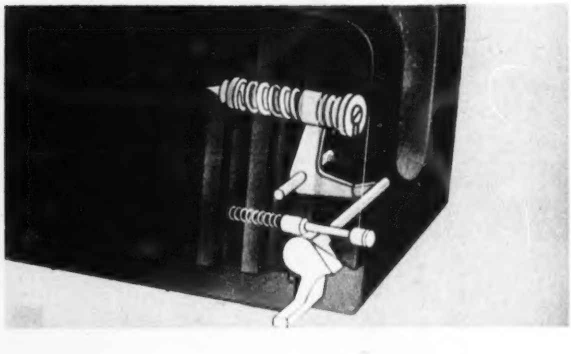




. . .or by a foot firing treadle which actuates a mechanical linkage. The trigger can also be tripped by hand.

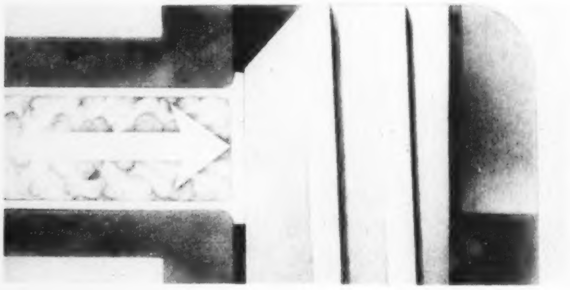


The foot firing linkage must be inspected regularly to make sure there is no binding or freezing of the parts. This will not occur if the mechanism is lubricated and exercised frequently. Also, all electrical contacts, leads and insulation in the electro-magnetic system must be kept clean and free of breaks.



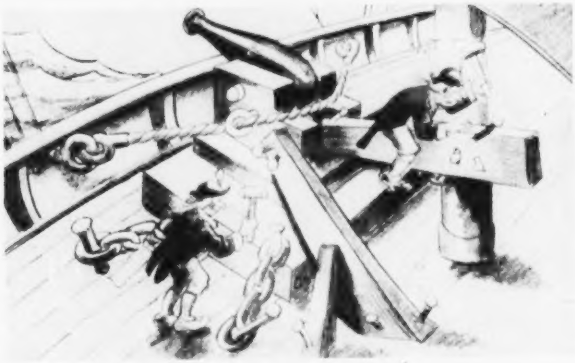
The firing mechanism of the 3"/50 is closely related to the gun's rate of fire. Good performance can be expected only when the mechanism is kept in perfect working order at all times.

FUNCTION OF THE RECOIL AND COUNTERRECOIL SYSTEMS

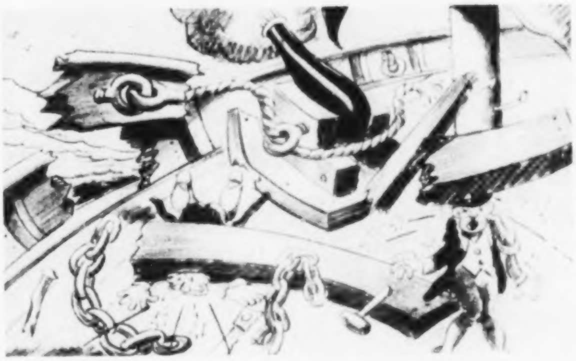


An exploding charge exerts a great force against the breech block when the gun is fired. This force drives the gun aft in what is known as a recoil movement. To prevent damage to gun and ship, this force must be controlled.

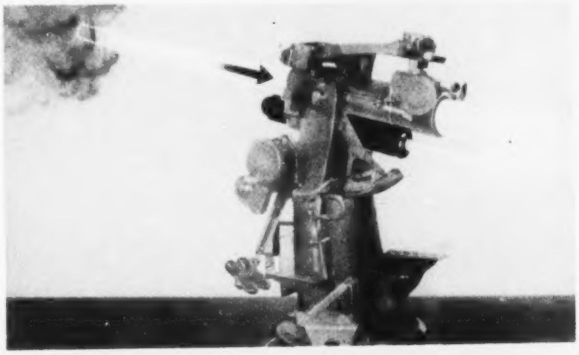
It might seem that one way to control recoil force would be to prevent it from moving the gun aft. Any of the old timers who may have tried this must have run into complications. It would be a tough job to devise a mount strong enough to take up the tremendous thrust of the exploding charge—without, at the same time, overloading the ship. After going to all this trouble. . .



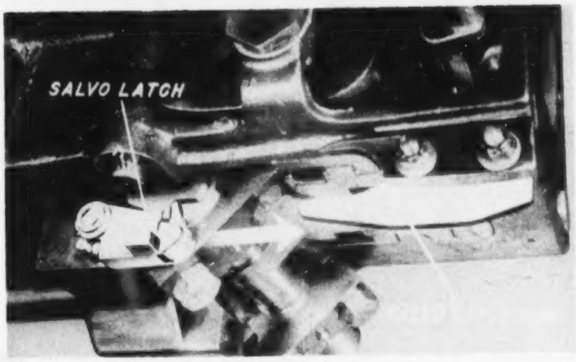
. . .it would be discouraging to find the system a little faulty. Fortunately, preventing recoil movement is not the only method for controlling recoil energy.

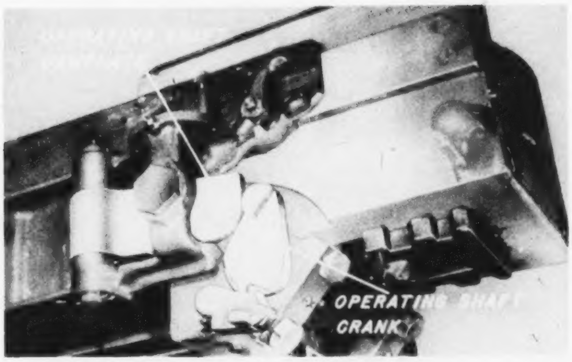


Guns like the 3"/50, are equipped with systems that absorb recoil energy gradually. The recoil system of this gun provides a constantly increasing resistance as the barrel and breech housing move aft in the slide. This resistance absorbs much of the recoil energy, but leaves a certain amount stored up to drive the gun forward again, in counter-recoil. The recoil movement of the gun is used to good advantage. . .

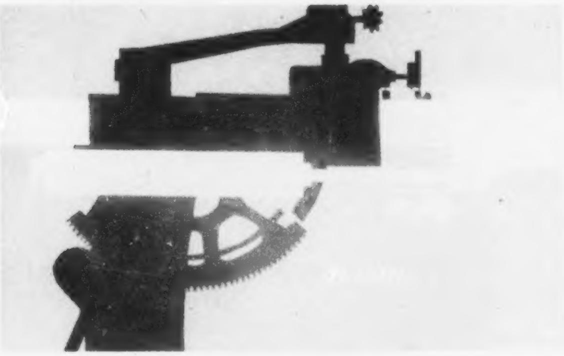


. . .in operating the salvo latch. As we know, this latch moves under the salvo latch cam and is tripped when the gun recoils. Also the recoil energy makes possible the counter-recoil action, during which. . .

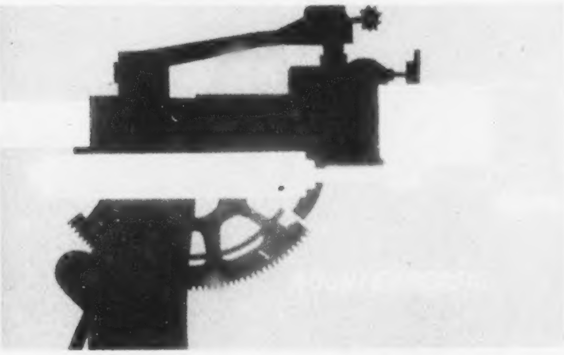




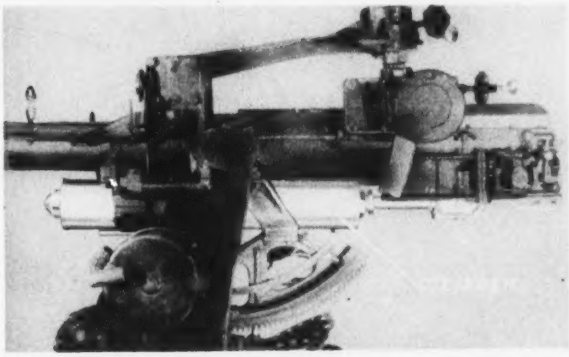
. . .the operating shaft cam plate and the operating shaft crank provide automatic opening of the breech. Again, in counterrecoil the use of original recoil energy provides one of the gun's valuable operating features. Let's see just how this energy is controlled by the recoil and counterrecoil systems.



During a recoil of 11 1/2 inches the resistance built up by the recoil system is sufficient to bring the gun to a smooth stop. At the end of recoil, enough energy is stored up in the system. . .

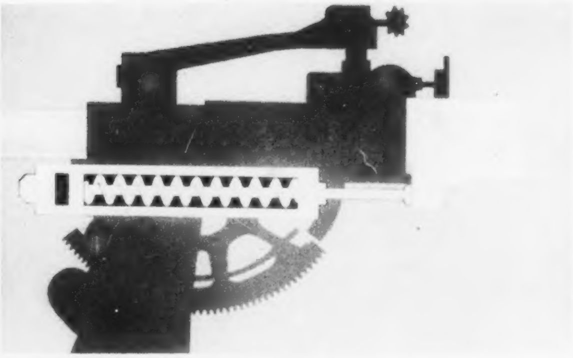


. . .to move the gun forward in counterrecoil—back to the battery position.

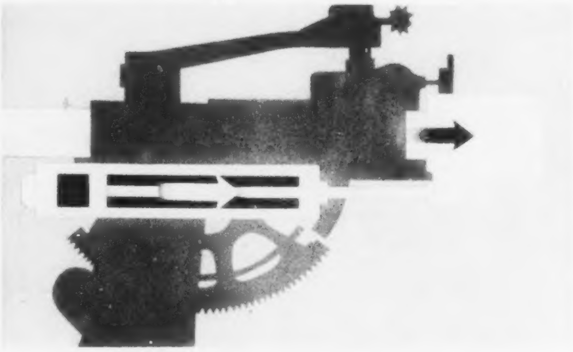


A cylinder secured to the underside of the slide, houses the recoil and counterrecoil systems, which operate together.

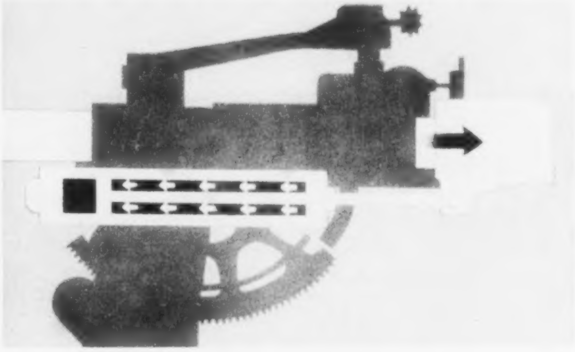
The recoil system is a combination spring and hydraulic system. A piston and piston rod, around which springs are coiled, are housed in the cylinder, which is filled with recoil liquid. The piston rod extends aft and is connected to the breech housing. In describing the system we shall first discuss its hydraulic features.



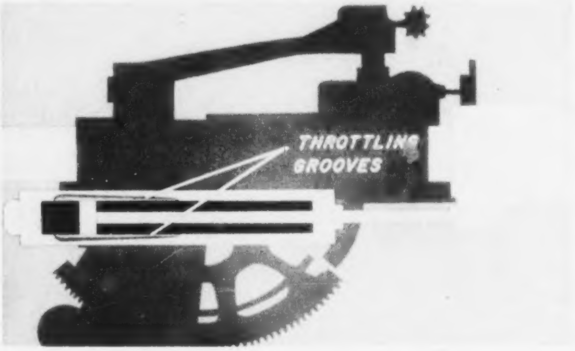
The cylinder is attached to the slide and does not move with the gun, but the piston is pulled aft in the cylinder as the breech housing moves aft in recoil. As the breech housing moves the piston aft. . .

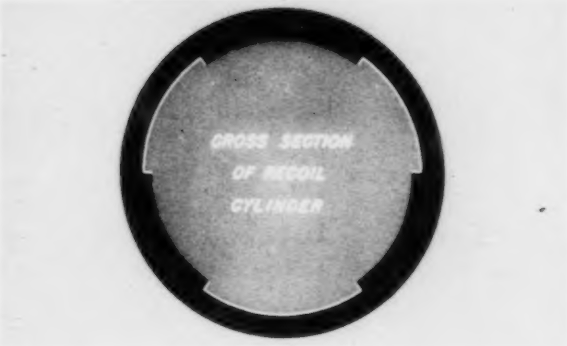


. . .a large pressure is built up in the after end of the cylinder. However, liquid cannot be compressed, so, for the piston to move aft, there must be some means of escape for the liquid. This means is provided by. . .

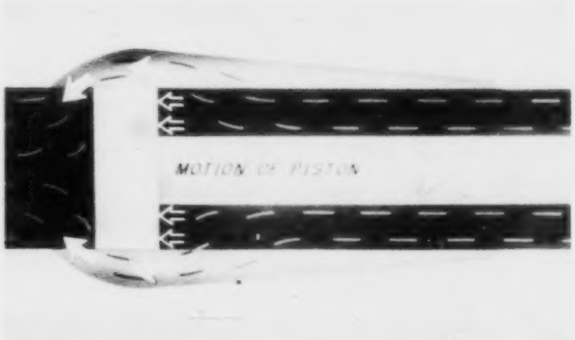


. . .throttling grooves, cut in the bronze lining in the cylinder. These grooves throttle the recoil movement.

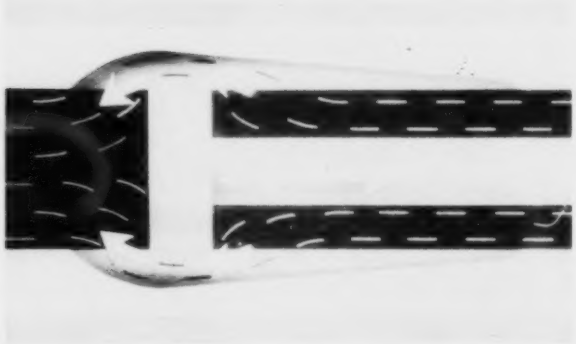




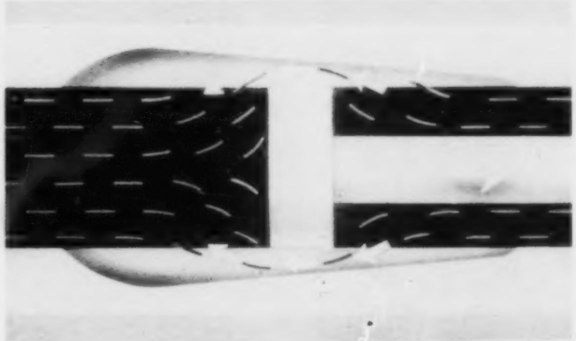
This cross section of the recoil cylinder shows that there are three of these throttling grooves, spaced equal distances apart.



When the motion of the piston is aft, during recoil, liquid is forced from the after end of the cylinder, through the throttling grooves, to the forward end. The resistance of the liquid to this motion helps to slow down or buff the recoil movement of the gun. To provide a smooth and even buffing action. . .

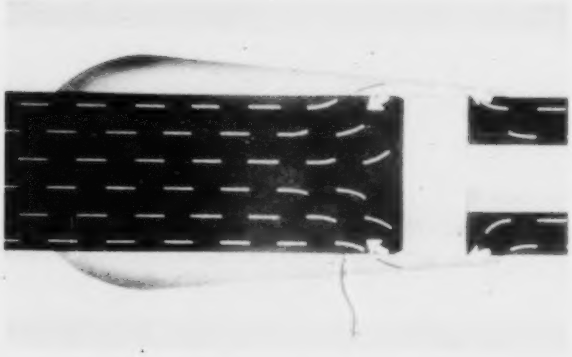


. . .the grooves are tapered, being deepest at the forward end. Thus they allow a maximum amount of liquid to escape when the recoil speed is at its greatest, just after firing. The amount of liquid that escapes at this time is greater. . .

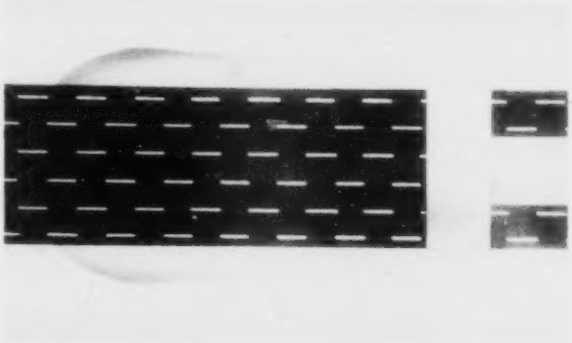


. . .than the amount which escapes when the piston is travelling over the shallower groove sections farther aft. Thus the size of the bypass for the recoil liquid is gradually reduced as the recoil speed diminishes. In this way a smooth, even slowing-down action is provided during recoil.

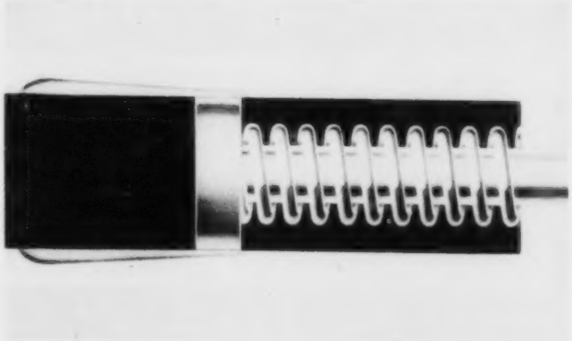
As the piston moves farther aft, toward the position of full recoil, very little liquid can escape through the throttling grooves. The recoil movement, now greatly slowed down. . .



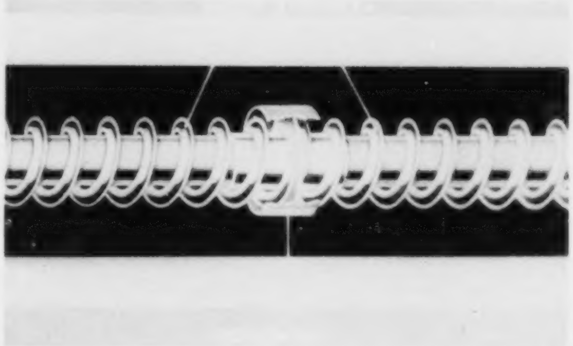
. . .stops just short of the point where the piston would completely close off the ends of the throttling grooves.

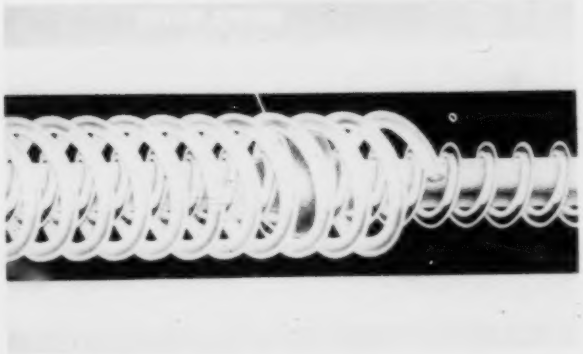


During the throttling action, the spring system is being compressed. When the energy thus stored up is equal to the remaining recoil energy, the gun comes to a smooth stop. The energy stored up in the spring system is used to force the gun forward in counterrecoil, as we shall see later. Let's look at this spring system more closely.

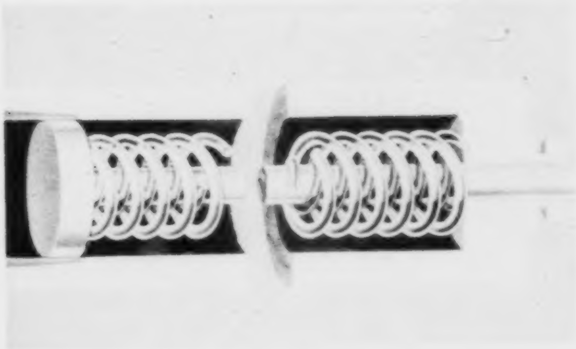


Two inner springs, held apart by a sliding brass separator, are mounted around the piston rod.

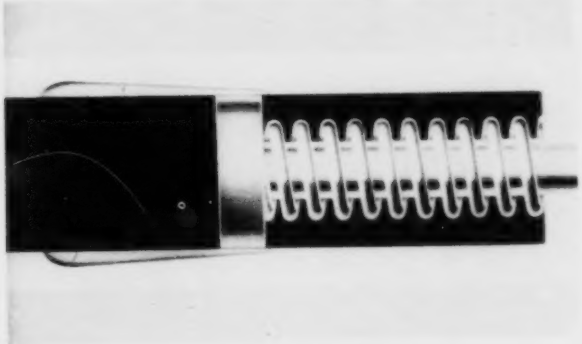




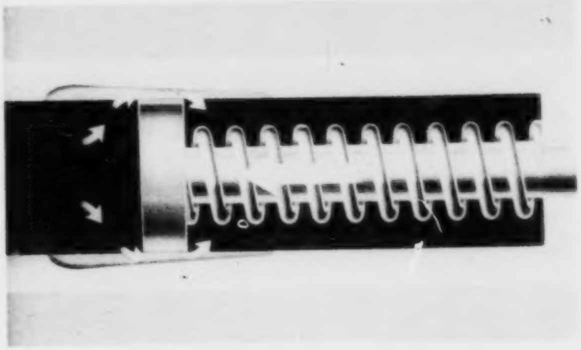
A heavier outer spring is mounted around the inner springs. The brass separator serves as a bearing for the mid-section of the outer spring, preventing it from buckling in compression and fouling with the inner springs.



The springs bear on the after cylinder head, thus permitting them to be compressed behind the piston.

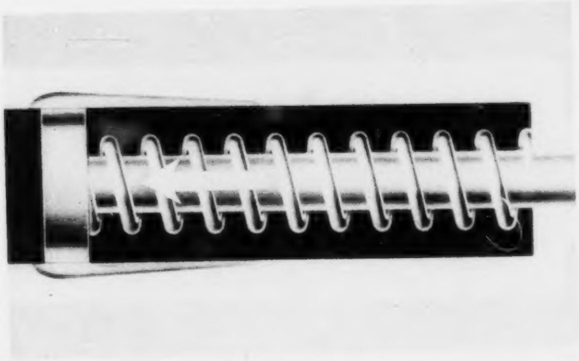


For simplicity the system is represented here by a single spring, which we see compressed at the end of the recoil movement. There is now stored up in this compressed spring system sufficient energy to cause a counterrecoil movement.

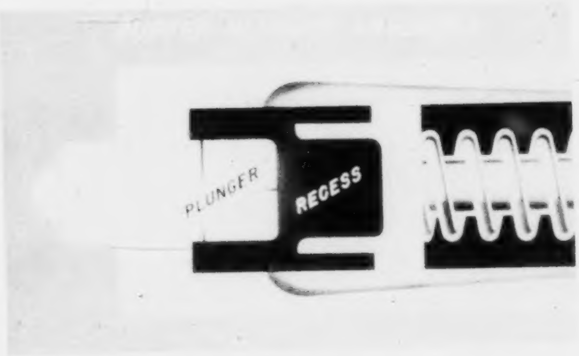


When this counterrecoil movement begins, the piston moves forward over the throttling grooves, and recoil liquid passes to the after end of the cylinder. At the beginning of counterrecoil, when spring pressure is greatest the throttling grooves are shallowest, thus providing the greatest buffing action.

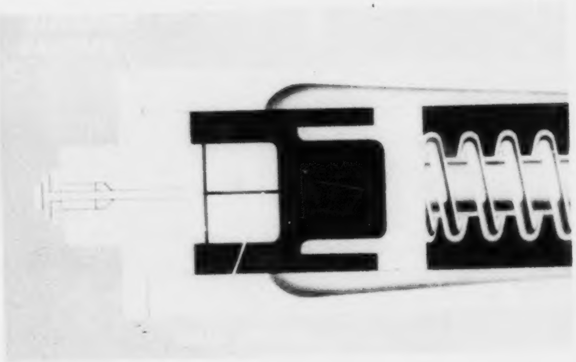
As the piston moves forward over increasingly deeper groove sections under decreased spring pressure, the buffing action is lessened. Thus the movement of counterrecoil, like that of recoil, is made smooth and even. The energy originally stored in the compressed springs is being used up—but some still remains—and this remaining energy could cause violent arrival of the gun in battery, if it were not controlled. . .



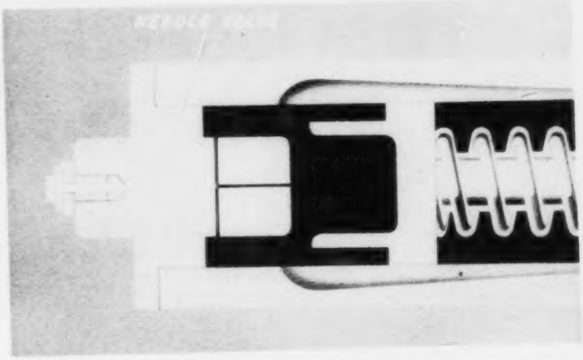
. . .by a buffer plunger assembly. This assembly, which brings the gun to a smooth and even stop, consists essentially of a fixed plunger secured to the forward cylinder head. It works in conjunction with a dashpot-shaped recess in the forward face of the piston.

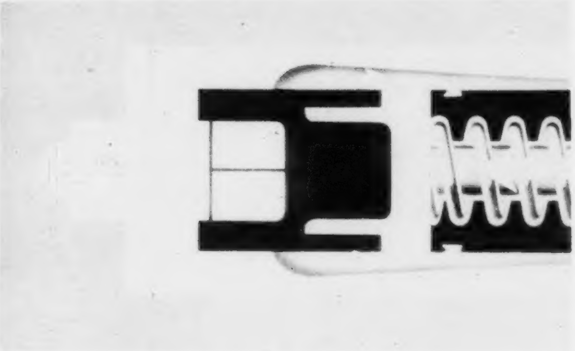


Discharge orifices bored transversely through the plunger connect at right angles with a main orifice extending to the after face of the plunger. At the intersection of the orifices. . .

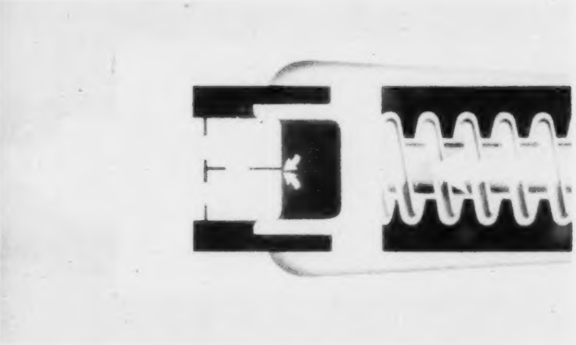


. . .is a needle valve which determines the speed by regulating the flow of liquid through the orifices.

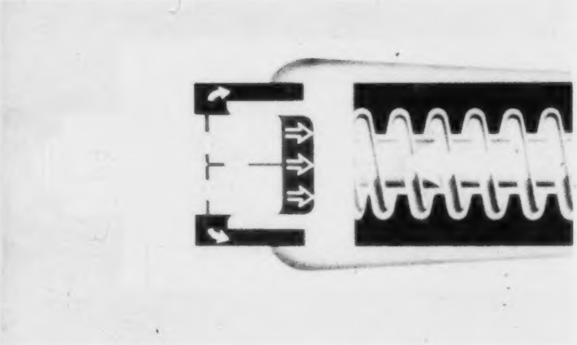




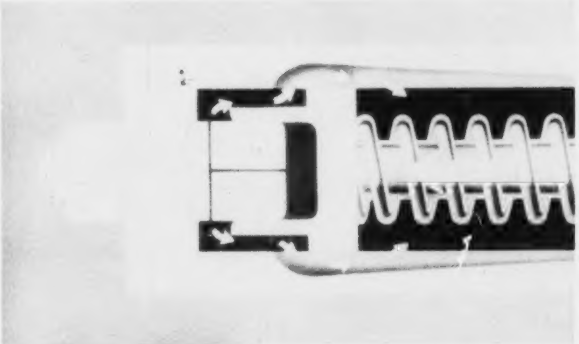
During the greater part of the counterrecoil movement, liquid flows only through the throttling grooves. Toward the end of the movement. . .



. . .the dashpot rides over the plunger, trapping an amount of liquid which can escape from the dashpot only through the discharge orifices as the piston rides forward. The flow of liquid through the orifices. . .

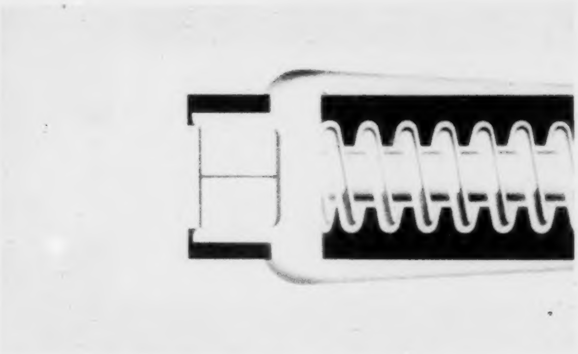


. . .is reduced by the needle valve to a very small stream. The resistance offered increases the pressure against the forward face of the piston and causes a buffing or slowing down of the counterrecoil movement. The limited amount of liquid discharged through the orifices. . .

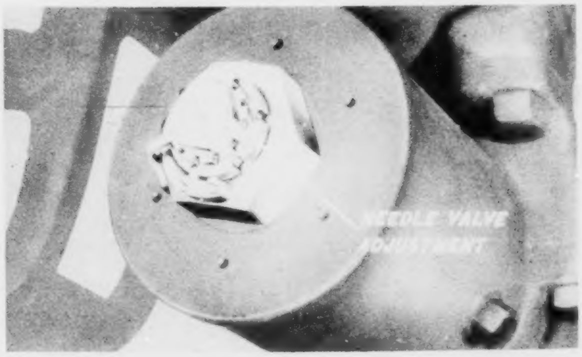


. . .is returned through the throttling grooves to the after side of the piston. It can be seen here that, after a very little additional travel, the dashpot will slide over the orifices, to close them off. However, a slight stream of liquid will still be allowed to slip past the inner face of the dashpot. . .

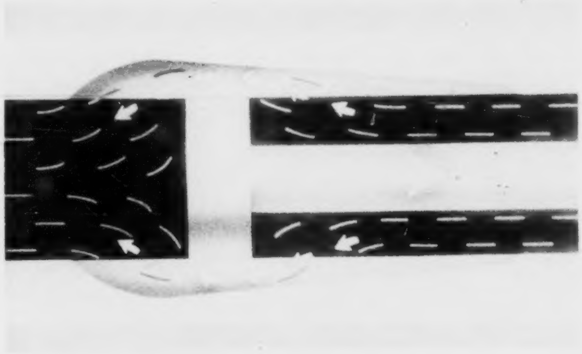
. . .until the gun arrives smoothly and evenly in battery. This final buffing action, which completes the cycle of recoil and counterrecoil, is performed satisfactorily. . .



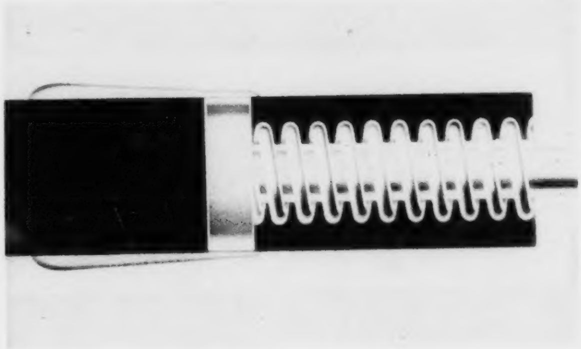
. . .only when a needle valve adjustment on the outboard end of the plunger is properly set. The setting is done only at the proving ground, and must not be changed aboard ship. Now that we have seen how all the parts of the recoil and counterrecoil systems function, let us briefly review the cycle of operation after firing.

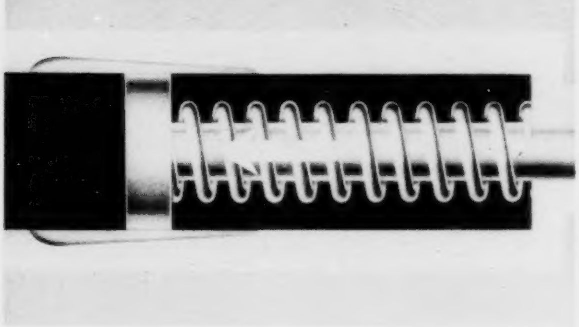


As the gun recoils the piston moves aft, and recoil liquid is forced forward around the piston through tapered throttling grooves. The resistance offered to the passage of the liquid slows down the recoil movement. . .

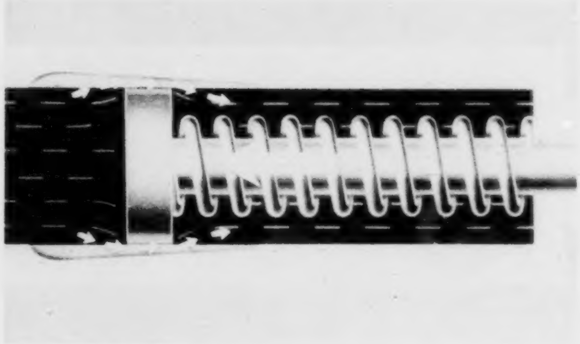


. . .which also is retarded and stopped by the spring system. The energy stored up by compressing the springs during recoil. . .

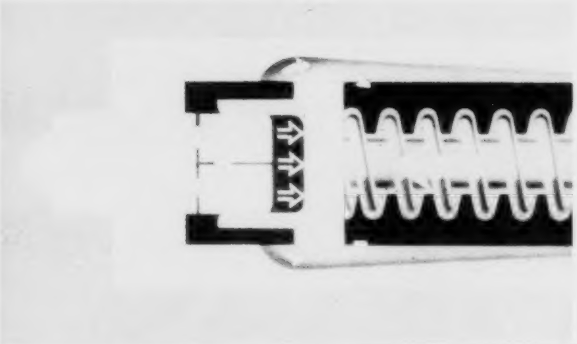




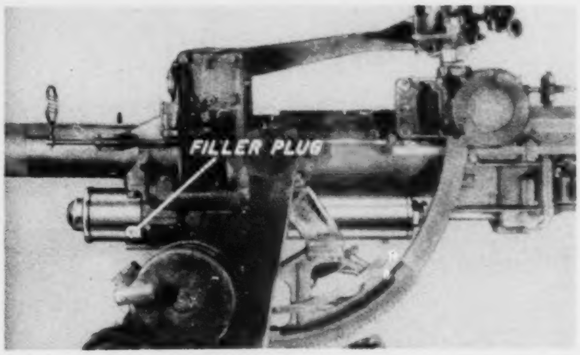
. . .is used to force the gun forward in counterrecoil. The counterrecoil movement is slowed down and smoothed. . .



. . .by resistance to the flow of liquid through the throttling grooves.

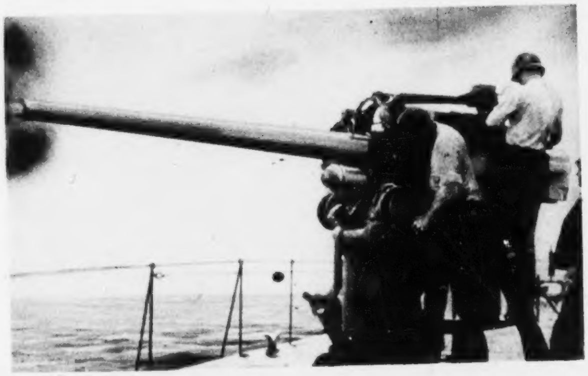


Near the end of counterrecoil the high resistance to liquid flow offered by the buffer plunger assembly brings the gun to a smooth stop—providing the system is kept properly filled with liquid.



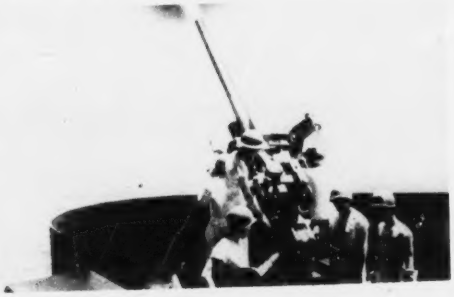
A filler plug toward the forward end of the recoil cylinder is removed to add liquid. Perfect operation of the system depends not only on keeping it properly filled but also on detecting and eliminating leaks.

Remember that the 3"/50 cannot operate efficiently unless it can recoil and counterrecoil properly. The only way to insure this is through a consistent and thorough program of maintenance.

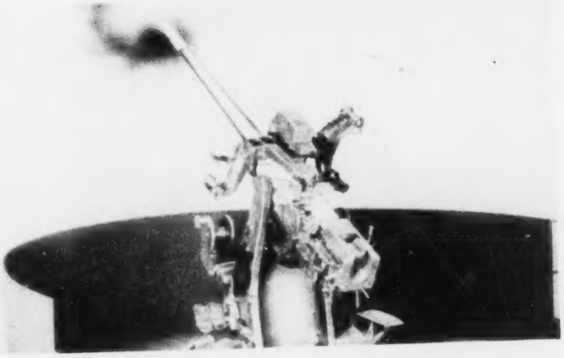


FUNCTION OF THE MOUNT

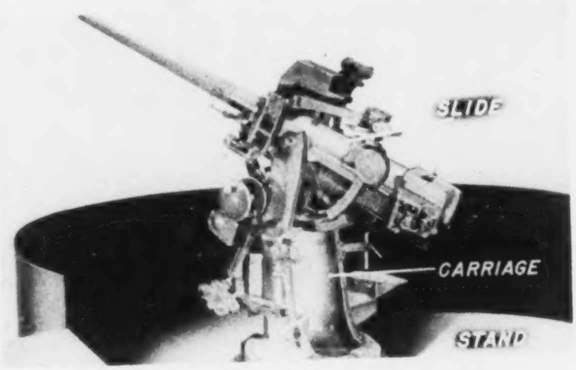
Up to now our study of the 3"/50 caliber has included mainly the parts of the gun directly related to firing. We have studied the breech mechanism, the firing mechanism, and the recoil and counterrecoil systems. We know that . . .

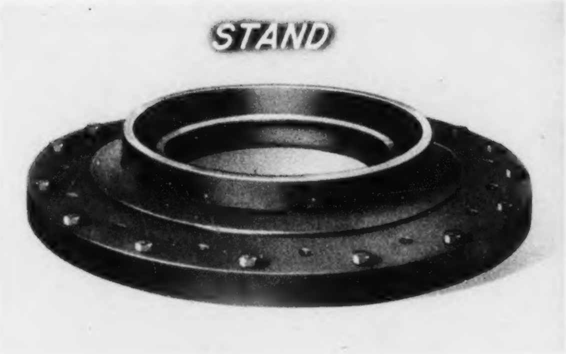


. . .the gun recoils and counterrecoils in a slide. . .

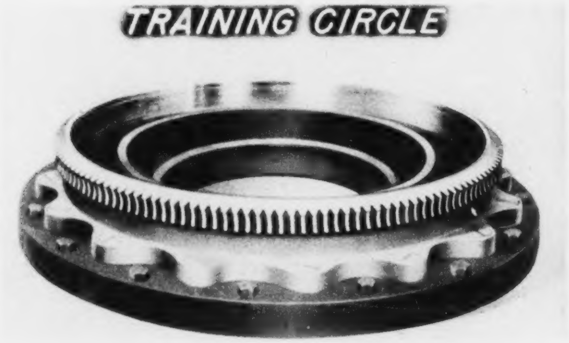


The slide is a part of the mount, which includes also the carriage and the stand. This mount supports the movements of the gun in train and elevation. Let's examine the construction of the mount to see how means for training and elevating are provided. We'll begin with the foundation of the mount. . .

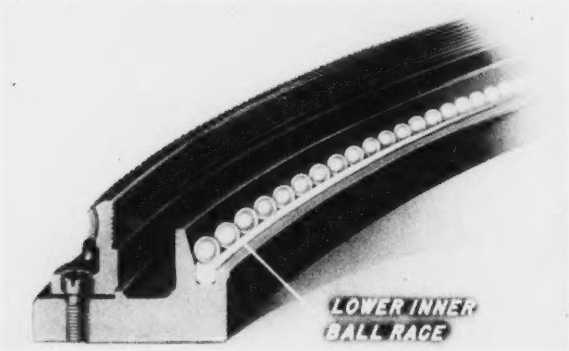




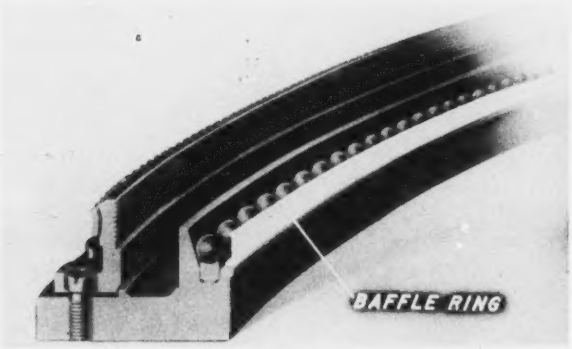
. . .which is the stand, a heavy cast steel ring bolted to the deck.



A training circle is bolted to the stand. This training circle is a large worm wheel which permits the mount to be trained by means of a worm assembly, as we shall see later.

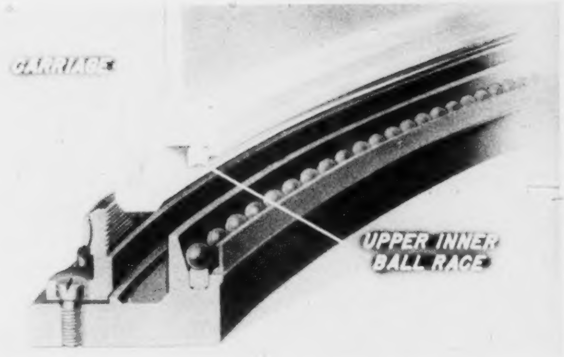


A lower inner ball race, shown here in cross section, is push-fitted into the stand. This race is a chrome-plated ring that extends entirely around the stand. It has a cupped surface on which ride chrome-plated balls that provide a bearing for the carriage.

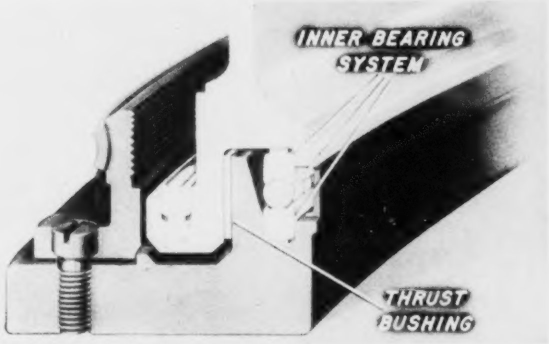


A baffle ring is secured to the inner side of the stand to retain lubricants and to protect bearing surfaces from the weather and from sea water.

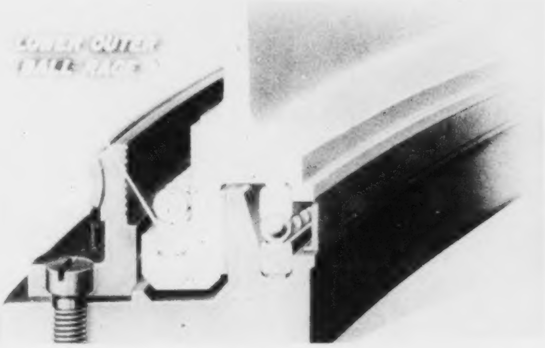
The carriage, with an upper inner ball race push-fitted into its underside, is shown ready for lowering into position on the stand. After the carriage has been lowered. . .


CARRIAGE
UPPER INNER BALL RACE

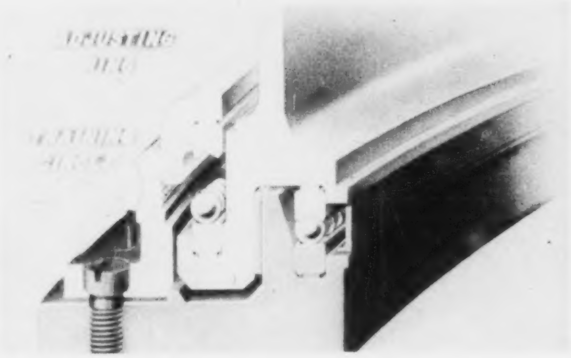
. . .an inner bearing system supports it as it is trained around. A bronze thrust bushing, secured to the stand, fits snugly against a machined surface on the carriage underside. This bushing centers the carriage on the stand and takes up all horizontal thrust caused by the firing of the gun and the motion of the ship. In addition to the inner bearing system. . .

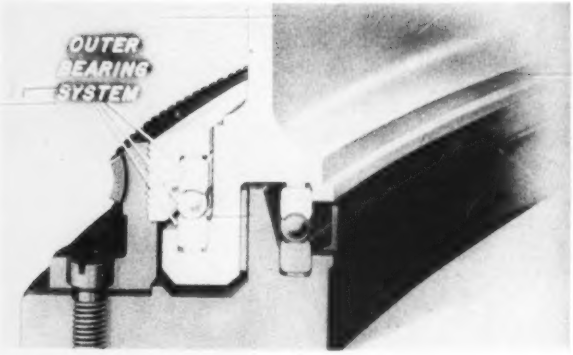

INNER BEARING SYSTEM
THRUST BUSHING

. . .a lower outer ball race is push-fitted into the outer well of the carriage. Chrome-plated balls ride on this race. . .

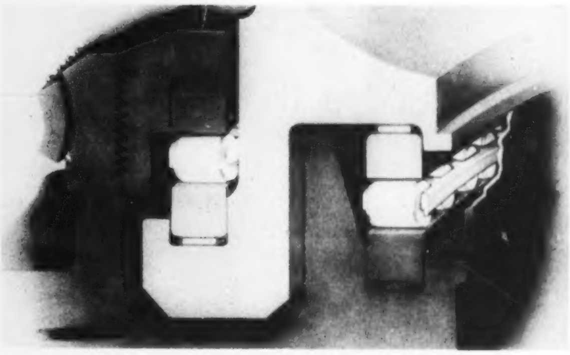

LOWER OUTER BALL RACE

. . .under a bronze adjusting ring screwed into the inner face of the training circle. The adjusting ring, shown partly screwed down, carries on its underside an upper ball race, forming. . .

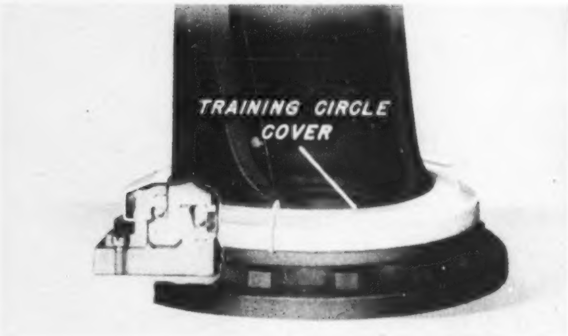

ADJUSTING RING



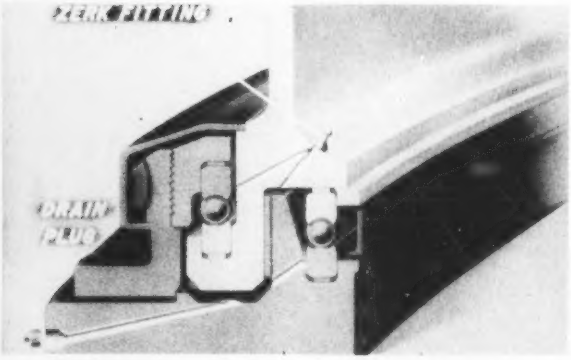
. . .an outer bearing system. When the adjusting ring is screwed down, the carriage cannot now be rocked off the stand by gun fire or when the ship rolls and pitches.



On some of the 3"/50's, rollers are used instead of balls in the outer and inner bearing systems and for the same purpose. That is, they afford a bearing for the carriage on the stand and prevent the carriage from rocking.

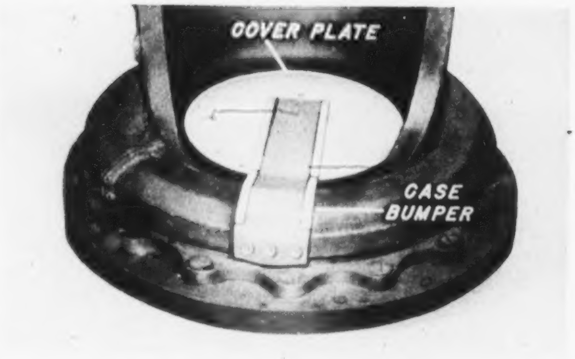


A training circle cover is bolted in sections around the carriage to protect the training circle and the bearing assemblies from the weather. To repel water all parts under the training circle cover must be kept well packed with lubricant. . .

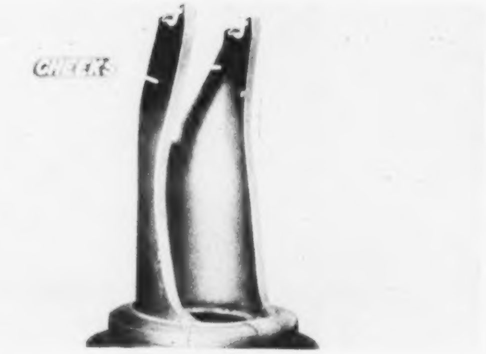


. . .through Zerk fittings (now called lubrication fittings, hydraulic type) located around the lower inner part of the carriage. Four drain plugs, one of which is shown here, are located on the stand. These plugs must be removed regularly to free the stand of any water that may have entered.

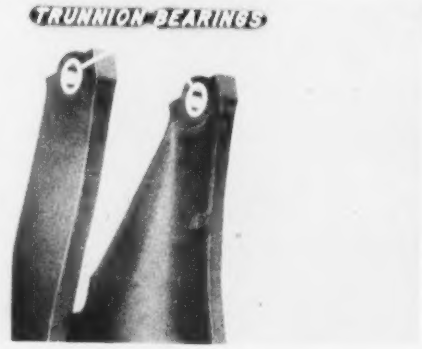
A cover plate is secured to the lower inner part of the carriage to protect the inner bearing assembly and the thrust bushing from the weather. A rubber strip known as a case bumper is attached to the cover plate and the training circle cover. This case bumper prevents damage to the mount and to fired cartridge cases when the gun ejects at high elevation.



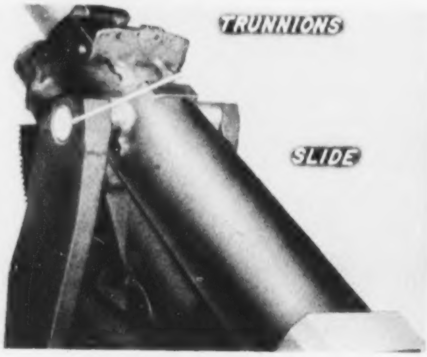
The upper parts of the carriage sides are known as cheeks. Since the 3"/50 is an anti-aircraft weapon, it has high carriage cheek to permit the gun to be elevated almost to the vertical. The tops of the cheeks are formed to receive. . .

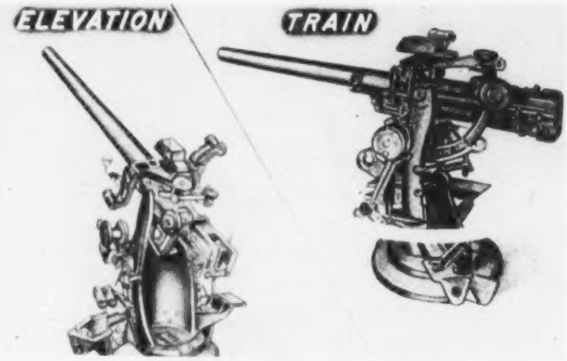


. . .trunnion bearings made up of bronze bushings secured to the cheeks by bearing caps. These provide a bearing system. . .

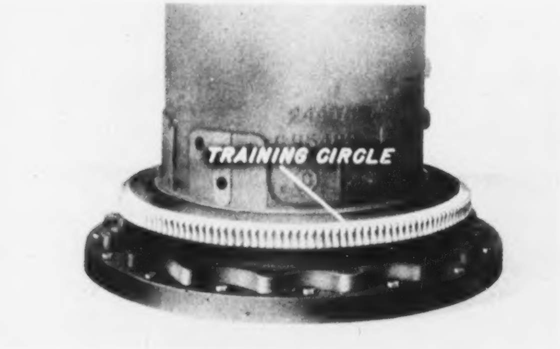


. . .for steel trunnions formed into the sides of the slide. When the trunnions are held in their bearings on the carriage they serve as pivots for elevating and depressing the slide.

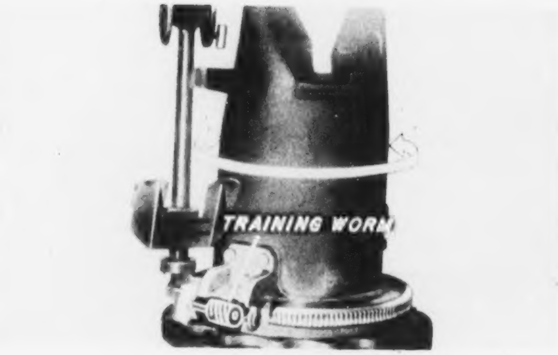




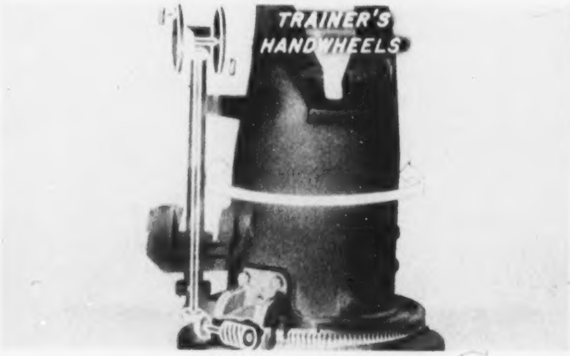
We know now that the gun can be moved in elevation on the trunnions—and that the mount can be moved in train by rotating it on the stand. Now let's see the gearing through which elevation and train are accomplished. We'll study train first.



The training circle, being attached to a stationary stand, is a fixed part with teeth cut to engage. . .

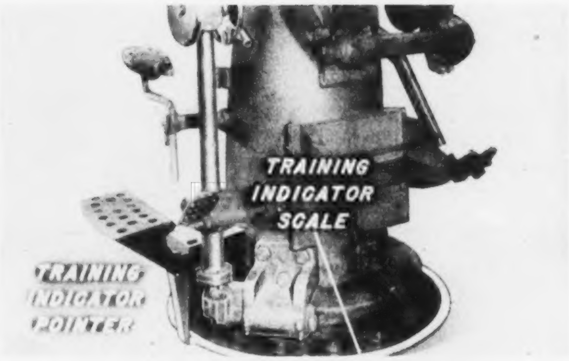


. . .a training worm. The worm is mounted in a housing secured to the carriage. It can be seen that, as this worm is rotated, it will move to a new position on the training circle, carrying the carriage with it. The worm is rotated. . .

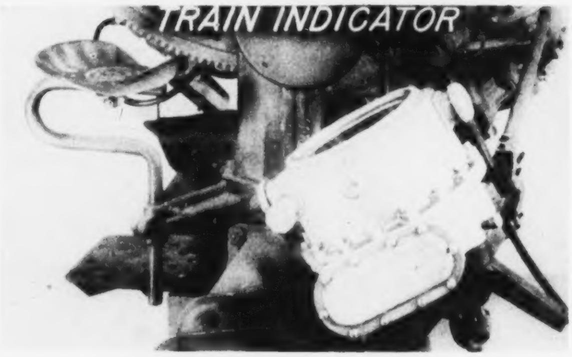


. . .by moving the trainer's handwheels. The motion of the handwheels is transmitted to the worm by shafts and bevel gears.

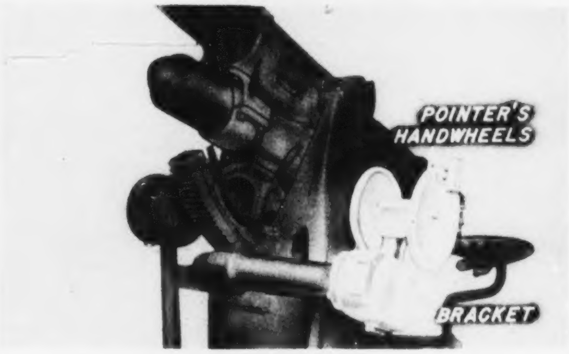
A training indicator scale secured to the stand and a training indicator pointer attached to the carriage enable the trainer to read, at any time, the amount in degrees to which the gun is trained. On some 3''/50's. . .


TRAINING
INDICATOR
SCALE
TRAINING
INDICATOR
POINTER

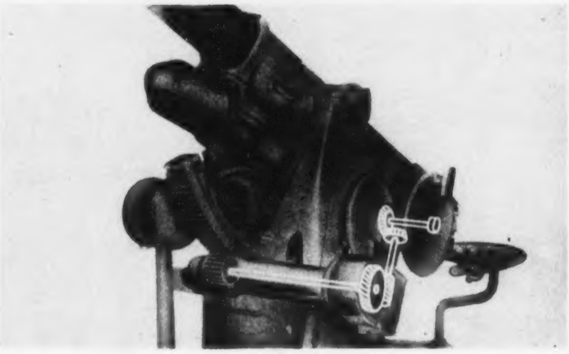
. . .a train indicator is included as standard equipment. This has gear driven dials which read the gun's position in train at any time. Furthermore, this indicator enables the trainer to train the mount according to electric signals from a gun director.

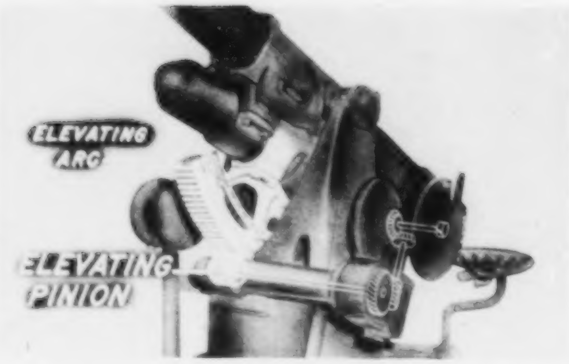

TRAIN INDICATOR

The gun is elevated by the pointer's handwheels on the left side. Below the handwheels is a handwheel bracket, secured to the carriage, which houses. . .

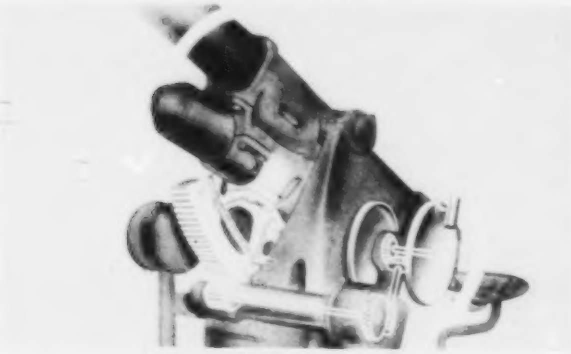

POINTER'S
HANDWHEELS
BRACKET

. . .gearing, including two bevel gears, a worm and a worm wheel. A shaft secured to the worm wheel extends inboard. . .

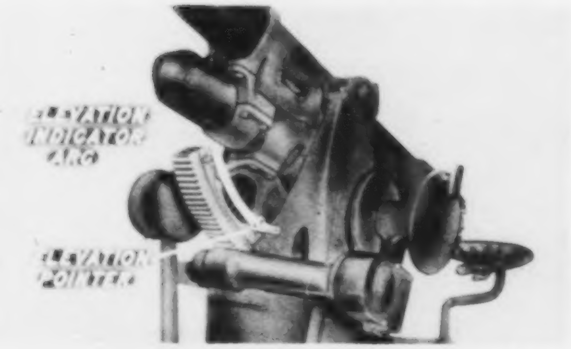



ELEVATING ARC
ELEVATING PINION

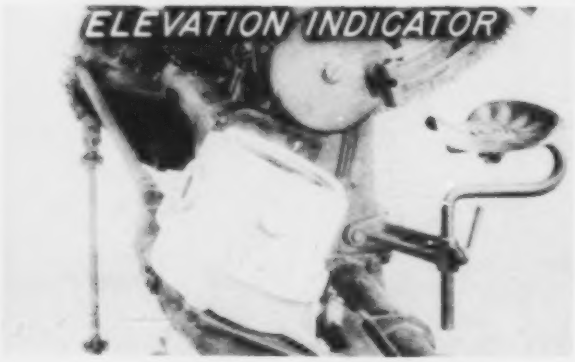
. . .to an elevating pinion which meshes with an elevating arc secured to the slide by a bracket.



The gun is moved in elevation and depression when the pointer's handwheels are turned.

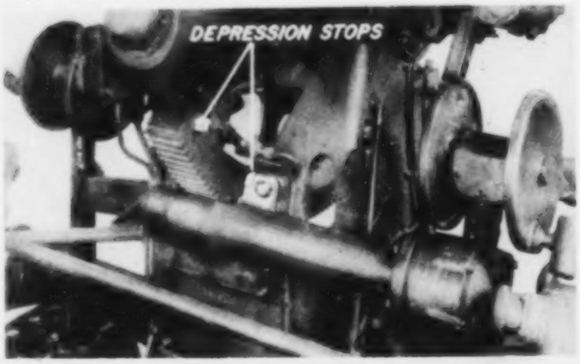

ELEVATION INDICATOR ARC
ELEVATION POINTER

An elevation indicator arc secured to the elevation arc bracket and an elevation pointer attached to the carriage indicate the setting of the gun at any point between 85 degrees elevation and 13 degrees depression. On some 3"/50 mounts there is also. . .

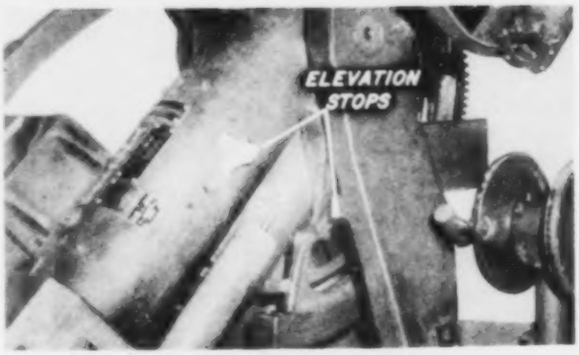

ELEVATION INDICATOR

. . .a gear driven elevation indicator which shows the number of degrees of elevation at any time. In addition, this indicator enables the pointer to elevate the gun in accordance with electric signals from a director.

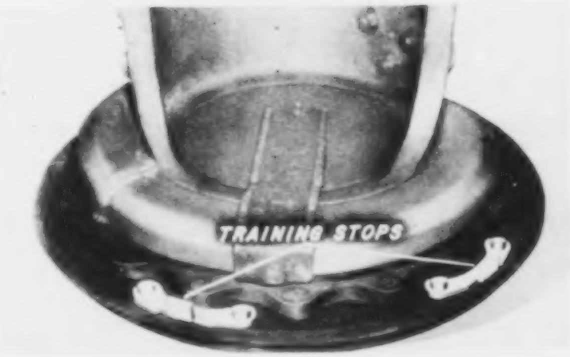
Depression stops limit the depression of the gun to 13 degrees below the horizontal. When this point is reached a pin at the forward end of the elevating arc bracket strikes lugs on the carriage. Here we see only the end of the pin projecting from the left side of the bracket. The other end projects from the right side to strike a similar lug.



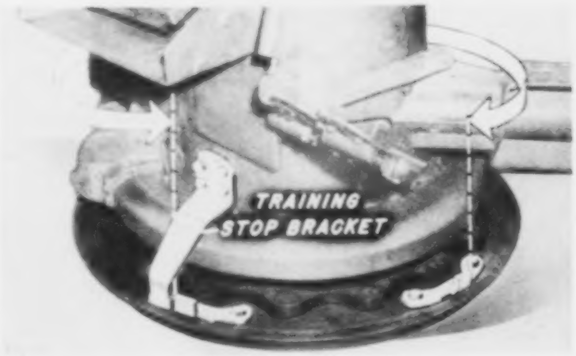
Elevation stops are provided on the right side of the gun. When the gun reaches an elevation of 85 degrees above the horizontal, a lug on the after end of the slide strikes a lug on the edge of the right cheek.



Two training stops are bolted to the base flange of the stand. These stops limit the train of the gun to prevent firing into the ship's structure. On each stop is a lug. When the gun reaches a limit the lugs are contacted by. . .

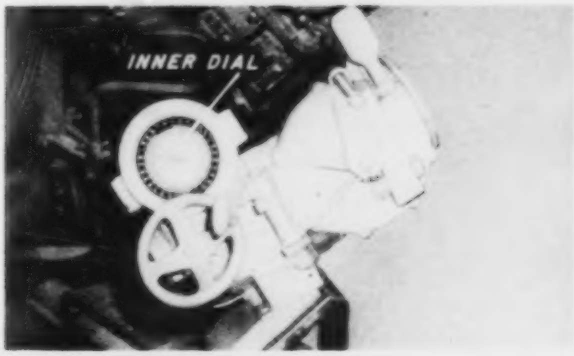


. . .a training stop bracket secured to the carriage. The stops are set so that the bracket strikes the stop lug when the carriage reaches the desired limit. As the gun trains around it carries with it. . .

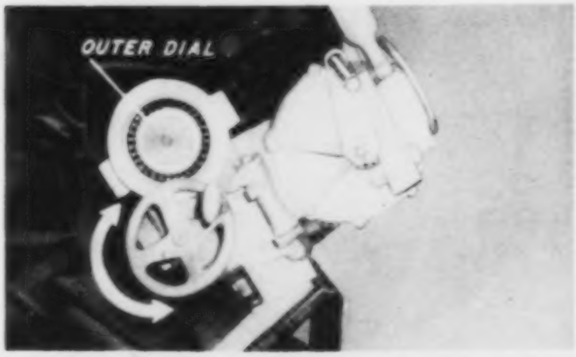


FUZE SETTER

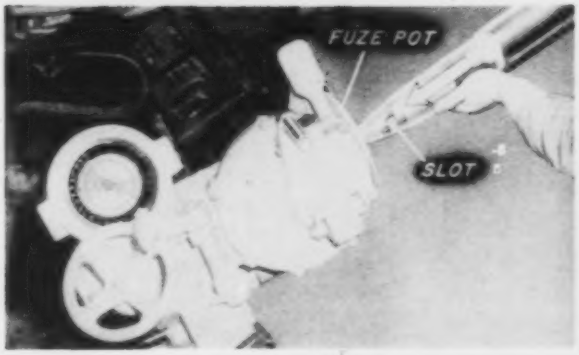
. . .a fuze setter secured to a bracket just aft of the pointer's seat. This mechanism is manually operated to set nose time fuzes on anti-aircraft and illuminating ammunition so that the projectiles will burst a selected number of seconds after leaving the muzzle of the gun. The operation of this fuze setter is simple.



An inner dial on the fuze setter is rotated by a director signal, carrying an index pointer to the signalled fuze setting position. With the inner dial in this signalled position. . .

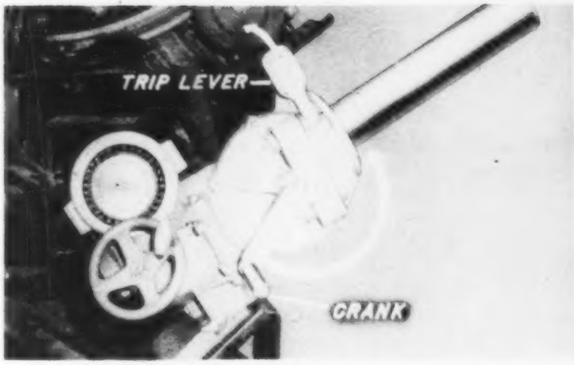


. . .an outer dial is rotated by the handwheel to match pointers. This sets up the internal mechanism of the fuze setter.

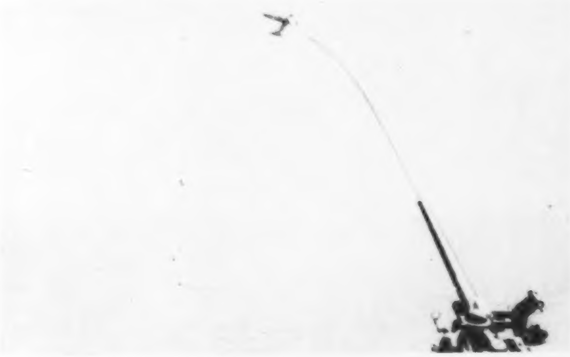


A rotatable fuze pot is designed to receive the nose of the projectile, with a slot on the nose fuze band lined up with a lug in the fuze pot. The fuze pot is rotated to set the fuze to the signalled setting. . .

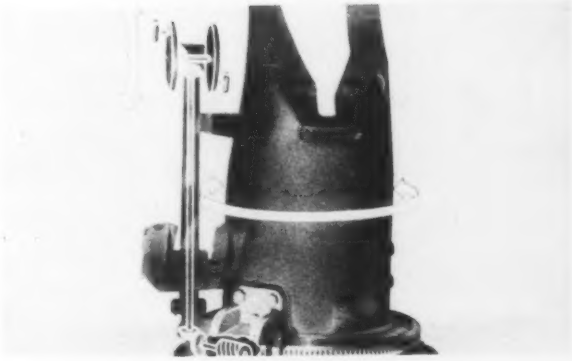
. . .by pushing a trip lever inboard and rotating a crank one complete turn. These actions set the fuze. . .



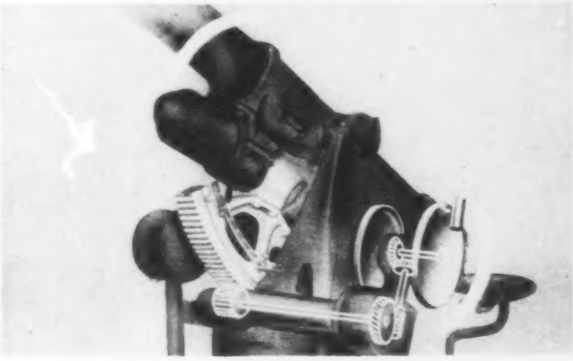
. . .to cause the bursting of the projectile a specified number of seconds after it leaves the muzzle, so that shell fragments will hit the target. We have now seen the important features of the 3"/50 mount. We have learned how the mount. . .

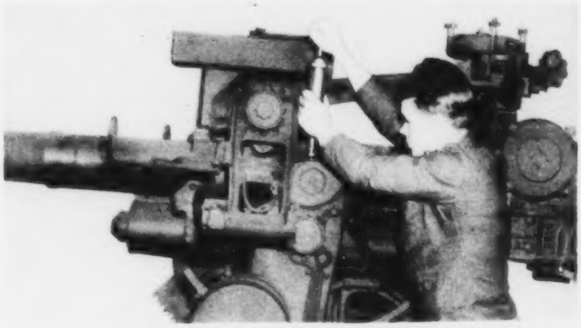


. . .is moved in train by the trainer's handwheels, which rotate a worm meshed with the training circle. We have seen how the gun. . .



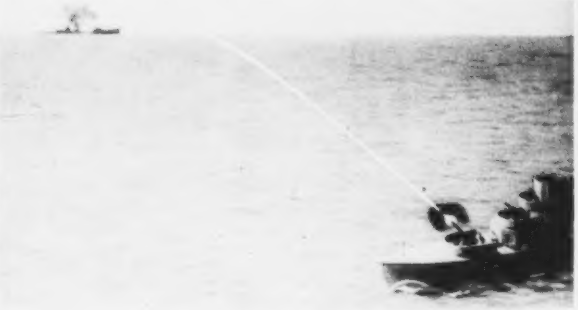
. . .is moved in elevation by the pointer's handwheels which actuate a gear linkage to the elevating arc.



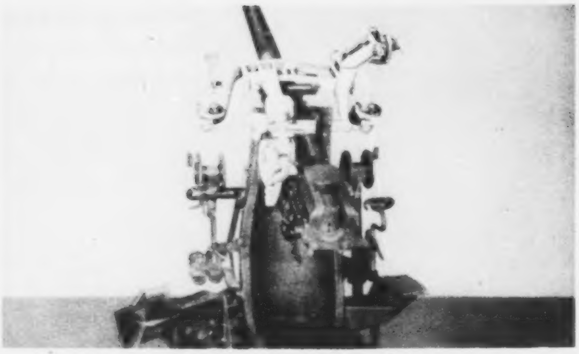


The mount of the 3''/50 is simply and ruggedly constructed. It will maintain a high rate of fire if it is kept in good working operation by consistent lubrication and general maintenance.

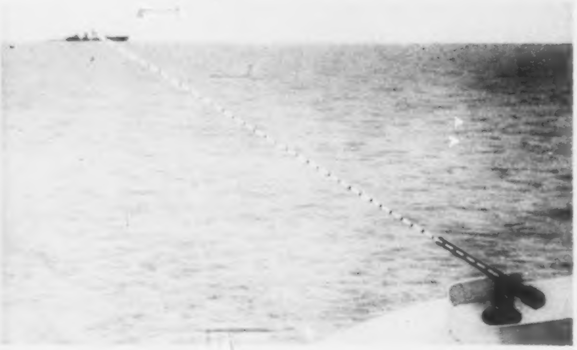
FUNCTION OF THE SIGHT



The 3''/50 has good range and a good rate of fire. But it can't make any hits unless it's properly sighted. Sighting the gun is the function of the sight mechanism we're about to study.

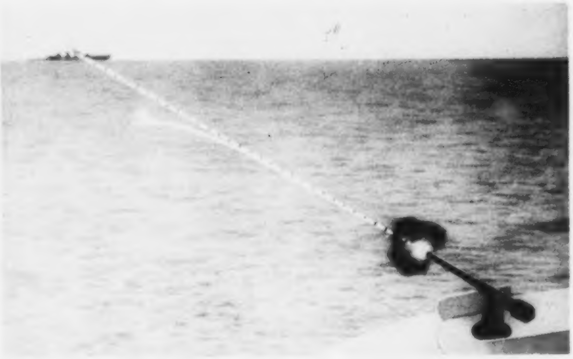


The sight mechanism includes the telescopes through which the pointer and the trainer aim at the target. It positions these telescopes so that the projectile will hit the target. To permit better understanding of the operation of this mechanism, we shall first outline briefly some of the principles of sight setting.

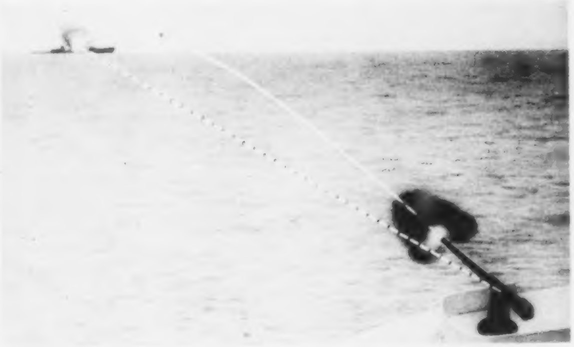


The sight mechanism is used to establish a line of sight between the gun and the target. Here the gun bore is parallel to line of sight. If the gun were to be fired now, the projectile. . .

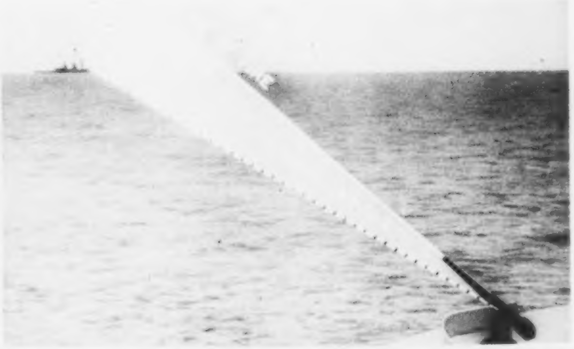
. . .would not reach the target, because the force of gravity causes the projectile to follow a curved path known as a trajectory.



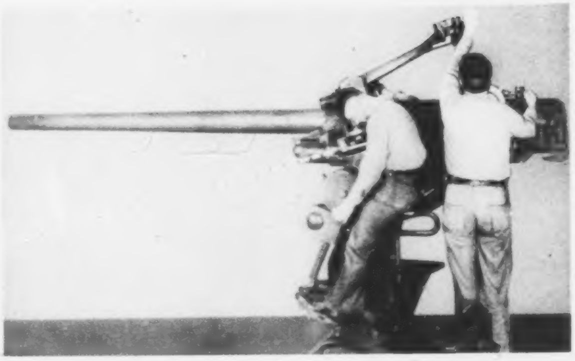
We can, however, elevate the gun and secure a higher trajectory to hit the target. When this is done. . .

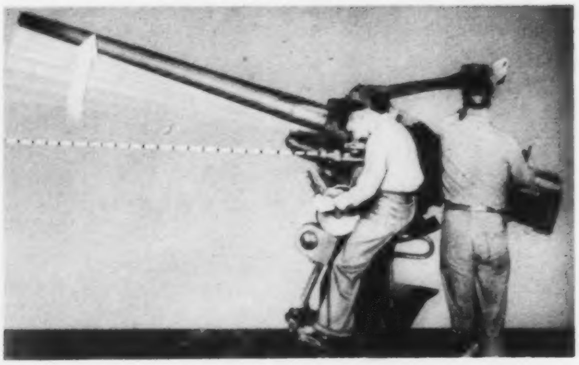


. . .the line of fire, which is an imaginary extension of the gun bore axis, is elevated above the line of sight by an angle called sight angle. The size of this angle depends on the range, or distance of the target from the gun. When the correct sight angle is determined. . .

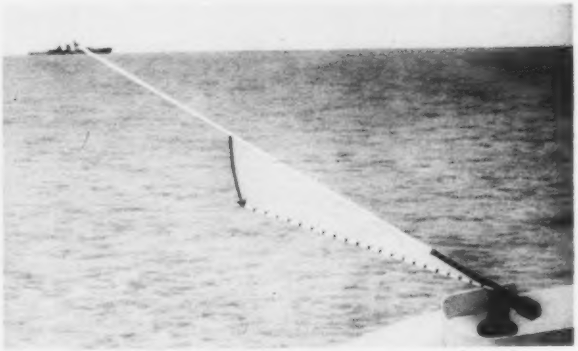


. . .it is introduced by the sight setter, who operates the sight mechanism to offset the sights by the required angle. When sight angle is set, it has no effect on the gun itself. But the sight angle thus formed remains as set. . .

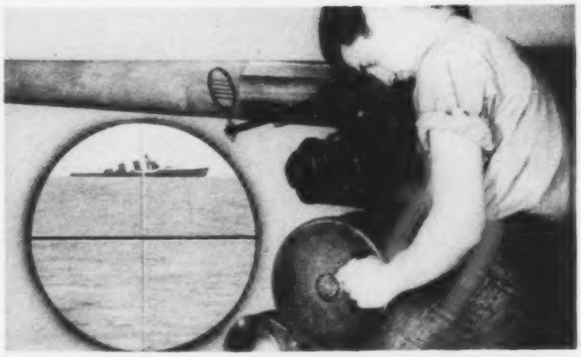




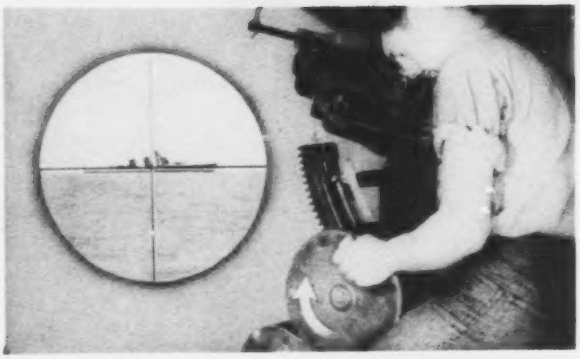
. . .when the gun is elevated by the pointer's handwheels.



Here, assuming the gun is pointed directly at the target, we see that setting the sight angle has caused the line of sight to drop below the target.

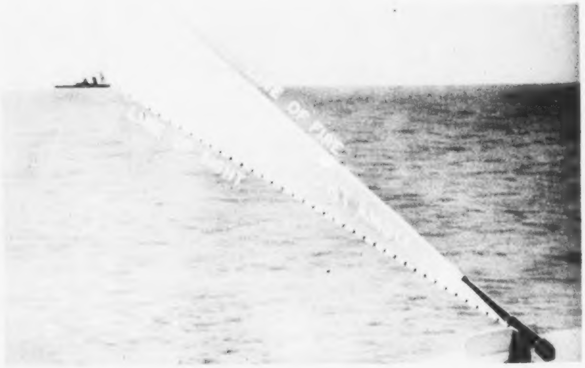


This causes the target to move above the horizontal wire in the pointer's sights. When this occurs, the pointer. . .



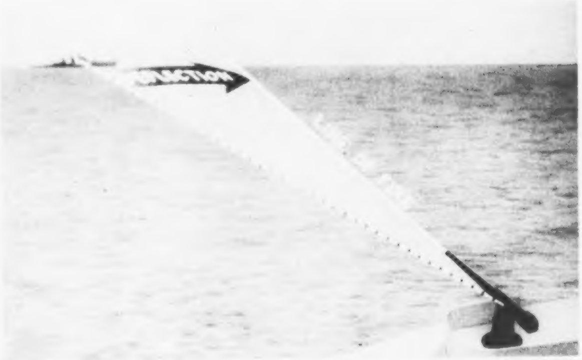
. . .turns his handwheels to bring the target on the horizontal wire. This turning of the handwheels elevates the gun. . .

. . .thus raising the line of sight and the line of fire together. When the line of sight is again on the target the gun is elevated to the sight angle required to secure a hit. We have been assuming, a stationary target. But what if the target is moving?

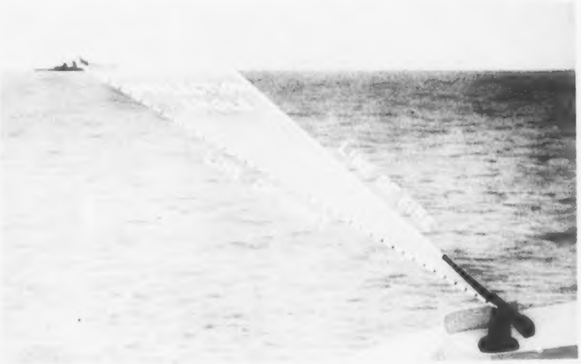


During the time of flight of the projectile, the target will have moved away from the point of aim. This difficulty can be overcome by establishing. . .

. . .a deflection between the line of fire and the line of sight. When the gun is fired this deflection will allow for the travel of the target during the projectile's time of flight, as well as for other ballistic quantities. Deflection is measured. . .

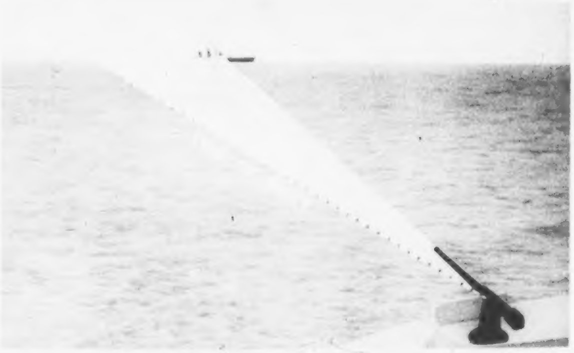


. . .by deflection angle, or the angle by which the line of fire is deflected from the line of sight. The deflection angle is set. . .

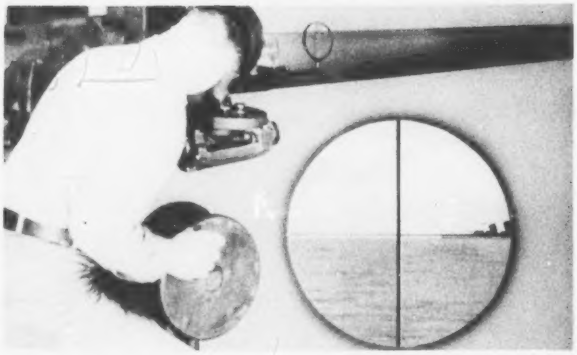


. . .with the sight mechanism. The sight setter operates this mechanism to crank in a deflection angle. The deflection angle offsets the line of fire from the line of sight, and remains as set. . .

. . .when the mount is trained by the trainer's handwheels. Let us observe now how a deflection angle is applied to secure a hit.

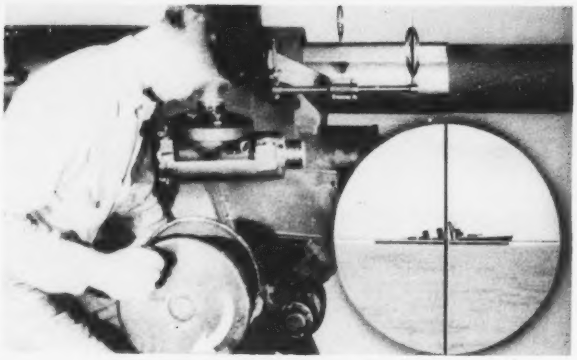


When a deflection angle is set, the line of sight is moved back of the target. Here, assuming the target to be traveling to the right, the line of sight is moved to the left. At this time. . .

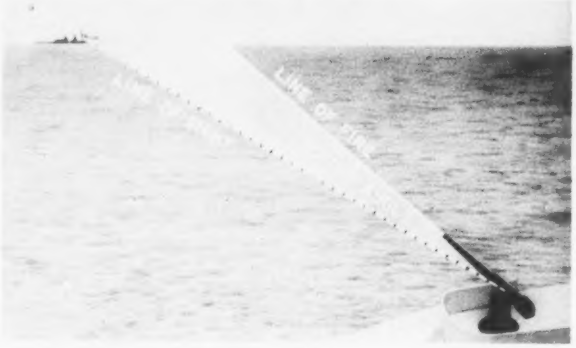


. . .in the trainer's sights, the target appears to be drifting to the right—off the vertical wire. The trainer. . .

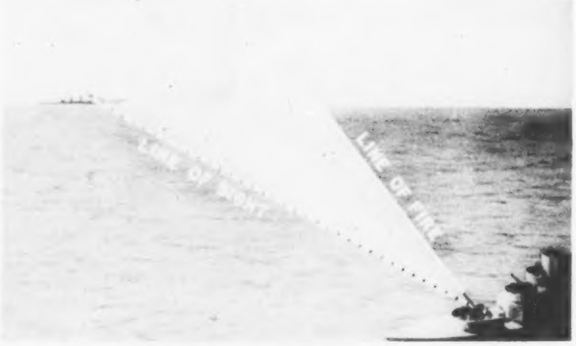
. . .turns his handwheels to bring the target back on the vertical wire. This turning of the handwheels trains the mount to the right. .



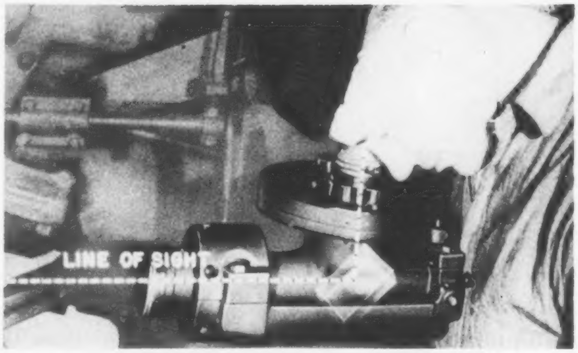
. . .until the line of sight is again on the target and the line of fire is offset at the required deflection angle. To summarize:. . .

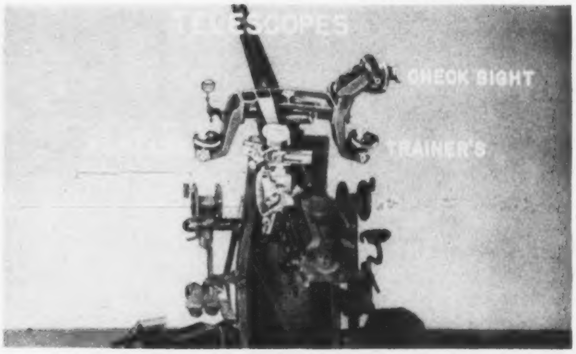


. . .the line of fire is offset from the line of sight by a deflection angle and a sight angle. We are now ready to study the sight mechanism which enables us to offset the line of fire from the line of sight.

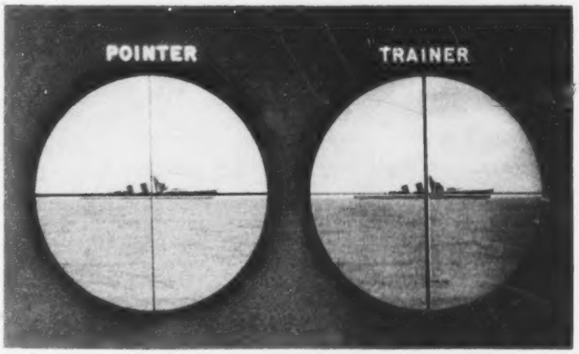


A line of sight is established on the gun by the pointer and trainer. Each man sights through a telescope containing lenses and a prism which provide an enlarged image of the target.

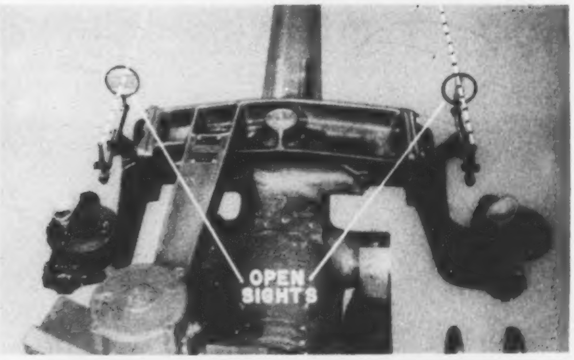




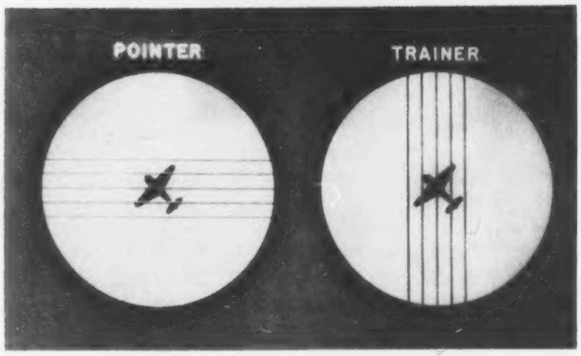
The telescopes are located at the sides of the gun—the pointer's at the left and the trainer's at the right. A check sight telescope is sometimes located above the trainer's station. This third telescope is used only for checking and will not be discussed further.



The pointer and the trainer, through their telescopes, see the target in the same position at the same time. The pointer's duty is to keep the target centered on the horizontal crosswire. The trainer must keep the target centered on the vertical crosswire.

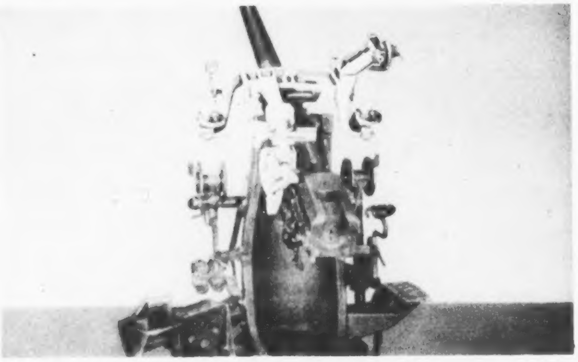


Open sights are provided for anti-aircraft fire.

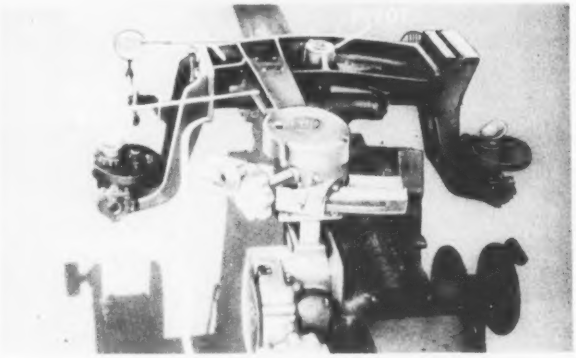


The pointer keeps the target centered on the horizontal bars of his open sights. The trainer keeps it centered on the vertical bars. The open sights are set by the sight mechanism in the same way as the telescope sights.

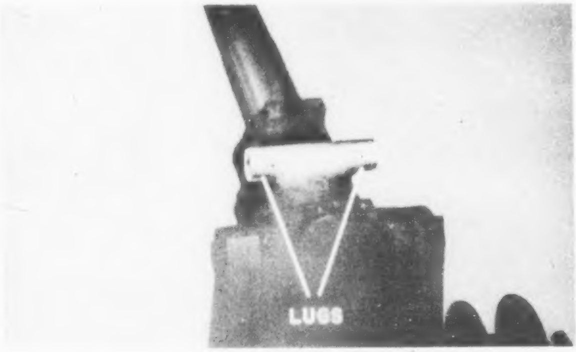
The sight mechanism is mounted on the slide. It consists essentially of a yoke, which holds the telescopes and open sights and controls through which the yoke is offset to form sight angles and deflection angles.



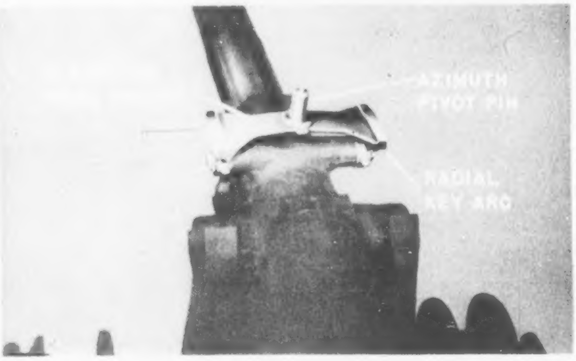
The sight yoke extends across the slide and is pivoted above the trunnions. A yoke arm extends aft to the controls. We shall now describe the construction of the mechanism, beginning at the forward end.

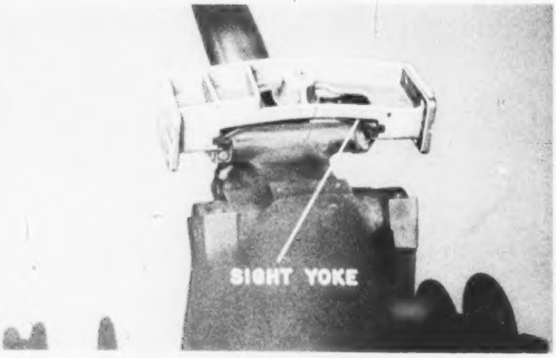


Two side lugs cast in the top of the slide provide a mounting for the sight yoke. These lugs are drilled to receive pivot or rocker pins which mount.

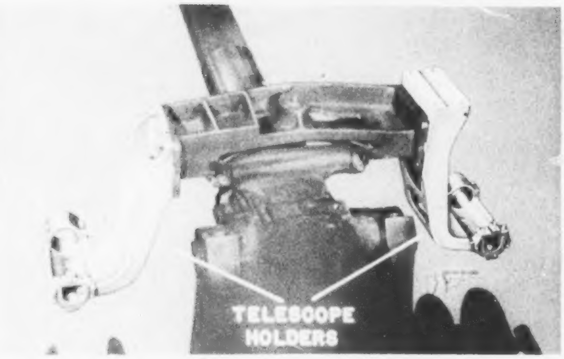


. . .an elevating gear rocker. In the center of the rocker is an azimuth pivot pin. At each outboard end is a radial key arc. The arcs serve as guides. . .

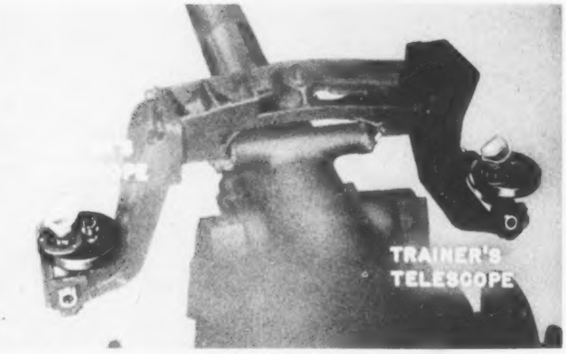




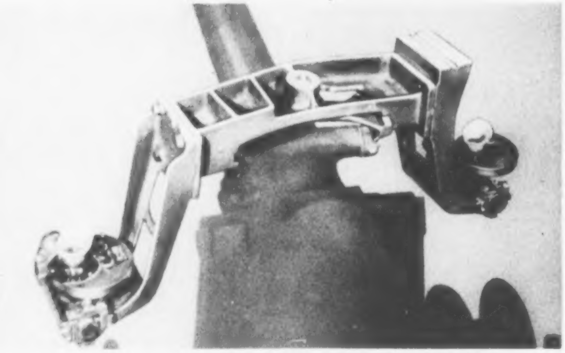
. . .for the sight yoke, which pivots on the azimuth pivot pin of the rocker. At each end of the sight yoke is a vertical bolting pad. . .


TELESCOPE HOLDERS

. . .to which telescope holders are bolted. In these holders. . .

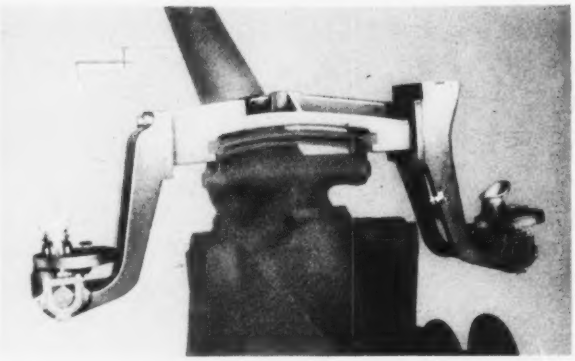

TRAINER'S TELESCOPE

. . .the pointer's telescope and the trainer's telescope are seated in adjustable mountings. The sight mechanism, as described so far, provides a means. . .

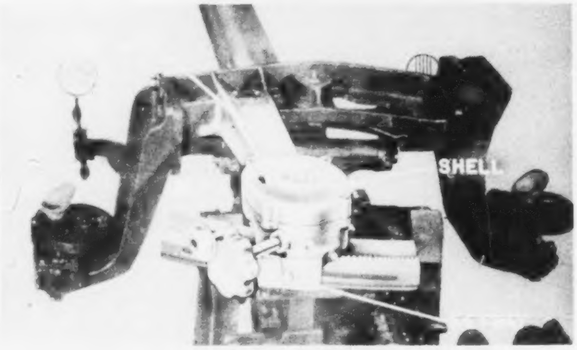


. . .for moving the telescopes together in the yoke to form a defection angle. . .

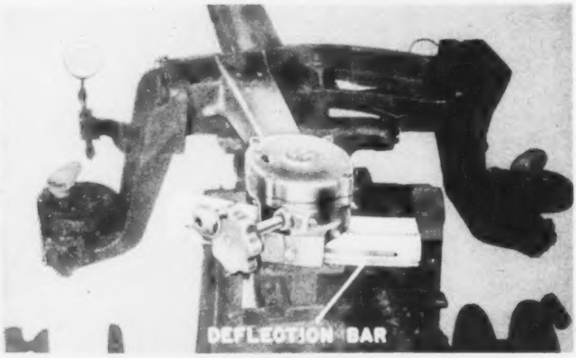
. . .and to form a sight angle. The sight yoke which moves the telescopes is itself moved. . .



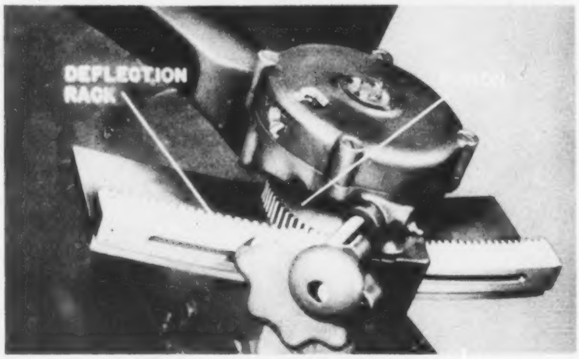
. . .by a yoke arm. This arm, which is a part of the sight yoke, terminates in a steel shell. At the after end of the shell is a keyway which engages. . .

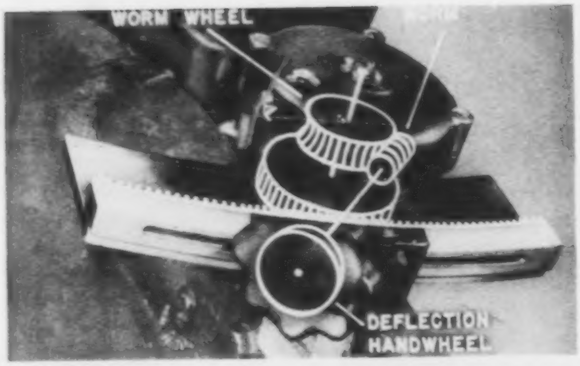


. . .a deflection bar mounted over a bracket on the slide. Secured to the deflection bar. . .

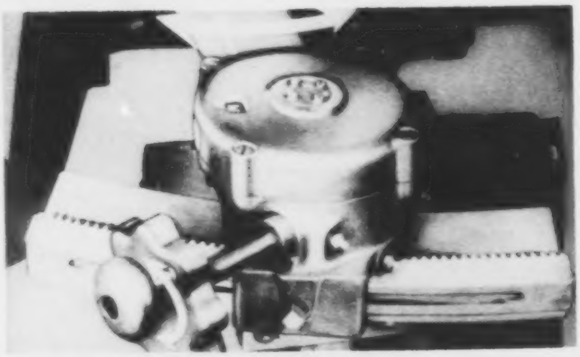


. . .is a deflection rack which meshes with a pinion in the shell. This pinion is connected. . .

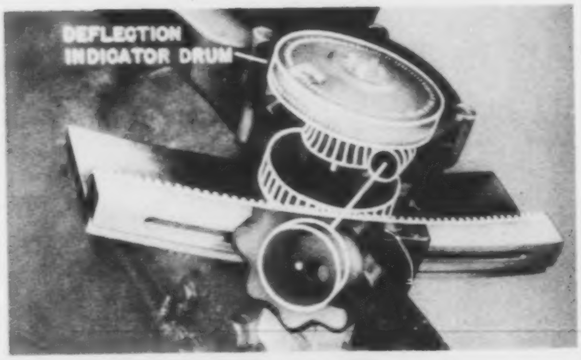



WORM WHEEL
WORM
DEFLECTION HANDWHEEL

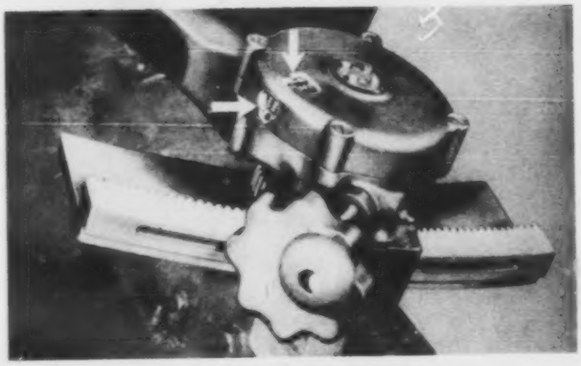
. . .to a worm wheel. The worm wheel meshes with a worm to which a deflection handwheel is connected.



The yoke arm is moved to right or left by turning the deflection handwheel. This forms deflection angles that are read. . .

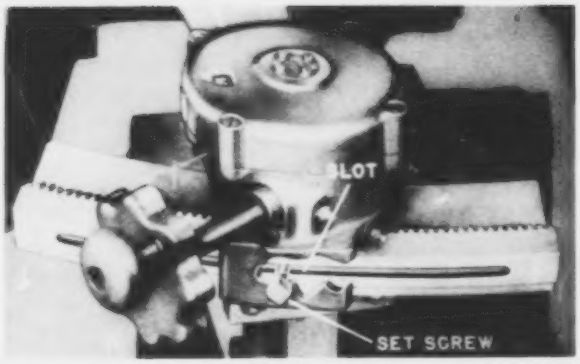

DEFLECTION INDICATOR DRUM

. . .on a deflection indicator drum located in the shell. Deflection angles are indicated in mils, 500 mils being zero deflection angle. All deflection angles are read. . .

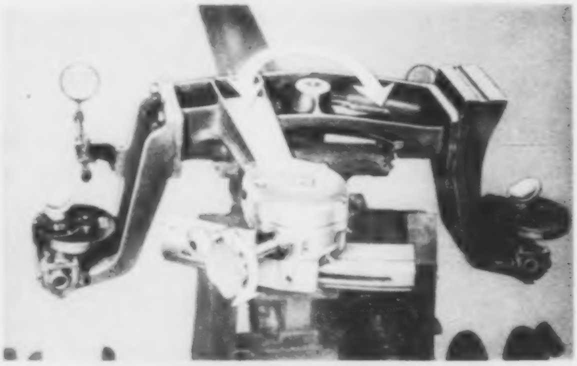


. . .at either of these openings on the shell.

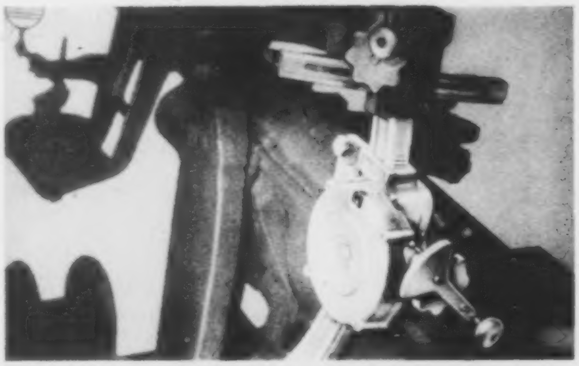
A slot cut part way across the after face of the deflection rack, and a set screw or pin in the shell keyway provide stops at the limits of right or left deflection angles. To set a deflection angle:. . .



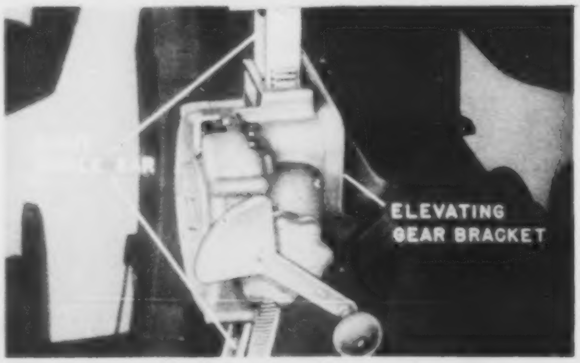
. . .the deflection handwheel is turned to rotate the sight yoke about the pivot pin to form a known deflection angle. This angle appears on the deflection indicator drum. Secured to the underside of the deflection bar. . .

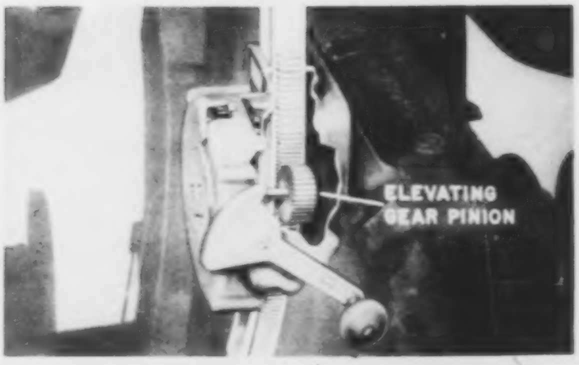


. . .is the sight angle mechanism. This mechanism forms sight angles by elevating the after end of the yoke arm through the deflection bar, which is raised. . .

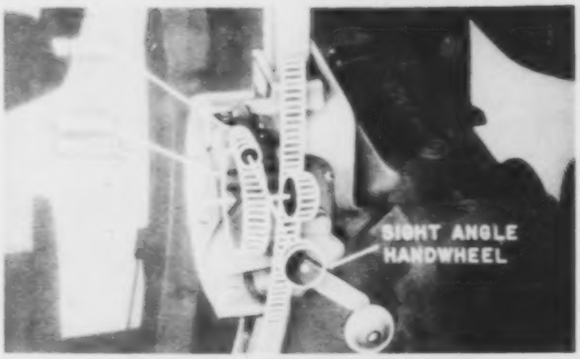


. . .by the sight angle bar. This bar is guided through an elevating gear bracket attached to the slide. Spur gear teeth cut in the after face of the sight angle bar. . .

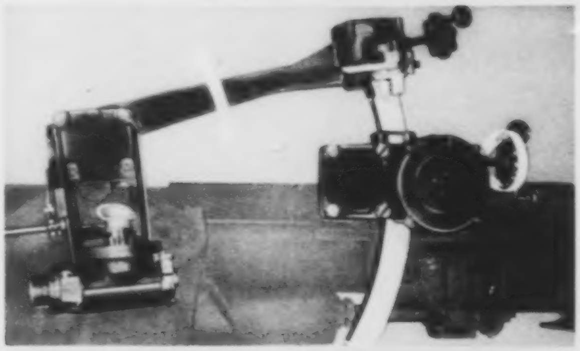



ELEVATING
GEAR PINION

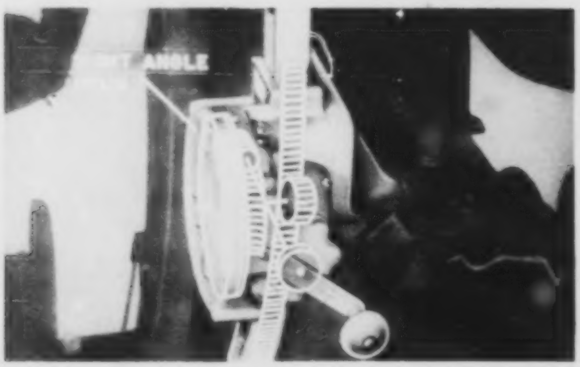
. . .mesh with an elevating gear pinion inside in the bracket. This pinion is connected.


SIGHT ANGLE
HANDWHEEL

. . .through a worm and a worm wheel, to the sight angle handwheel. This gearing

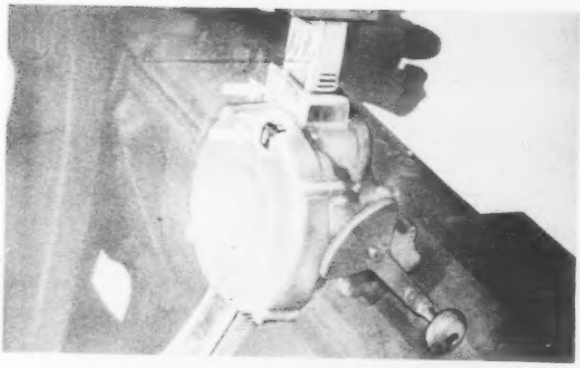


. . .elevates and depresses the sight angle bar when the sight angle handwheel is turned.

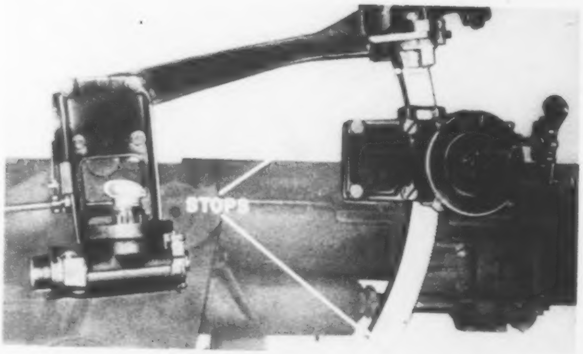


A sight angle drum connected to the worm wheel is graduated to indicate sight angles in minutes from zero to 1120 and ranges in yards from zero to 8400.

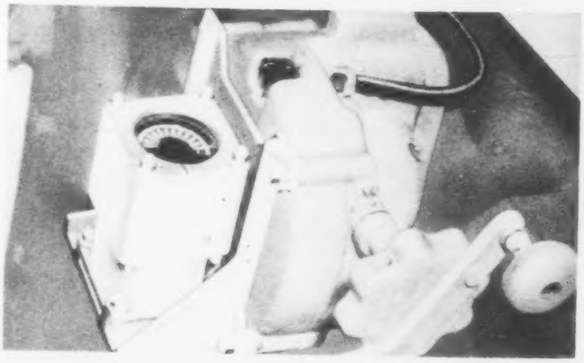
Sight angle is read at an opening on the cover of the sight angle indicator. The outboard face of the sight angle bar is also engraved to indicate sight angle and range.



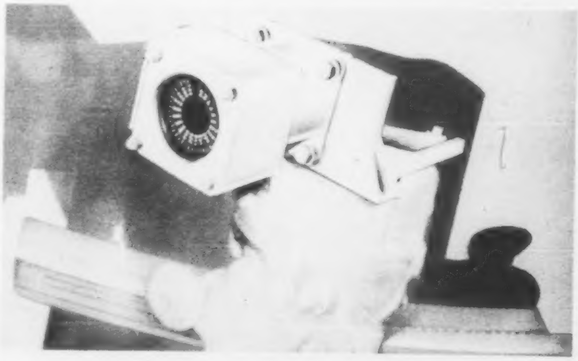
Stops are provided on the sight angle bar by pins secured to the bar itself. These pins strike plates on the elevating gear bracket when maximum and minimum sight angles are established.

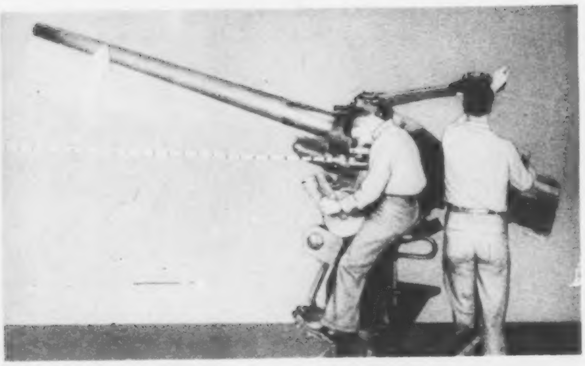


An electric sight angle receiver is mounted on the sight angle indicator drum of some 3"/50's. The sight setter observes the signals received by this device and complies with each by cranking in the angle required. On some mounts you will also find. . .

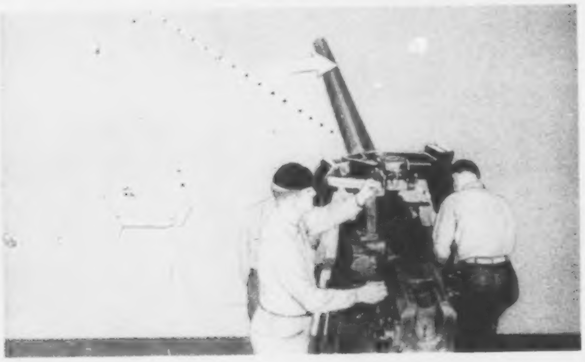


. . .a deflection receiver, mounted on the deflection indicator drum. This is used to receive deflection angles. This completes our description of the sight mechanism of the 3"/50. Let's review briefly some of the points we have covered.

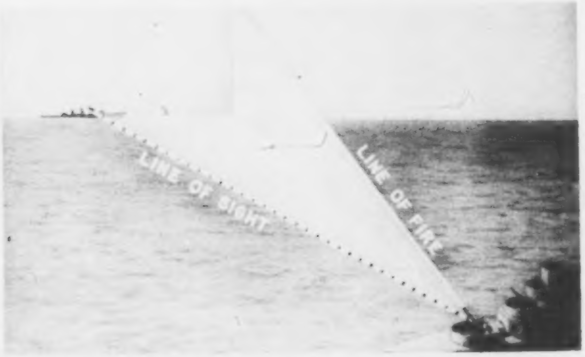




Sight angle is set in by the sight setter, and the gun is elevated by the pointer who operates his handwheels to keep the line of sight on the target.



Deflection angle is also set in by the sight setter and the mount is trained by the trainer, who operates his handwheels to keep his line of sight on the target. As a result of these operations. . .

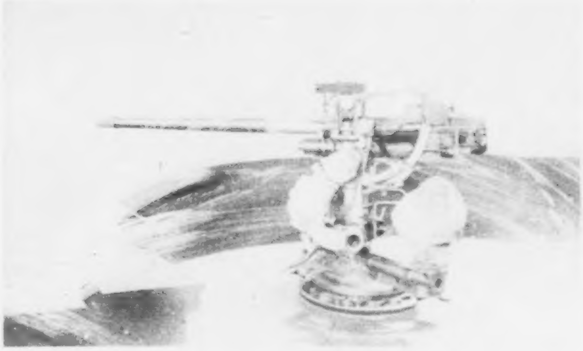


. . .the line of fire is offset from the line of sight by sight angle and deflection angle. The sight mechanism which establishes these angles may be called the eyes of the gun. Since it is constantly exposed to the weather, it must be carefully maintained at all times to assure efficient operation in action.

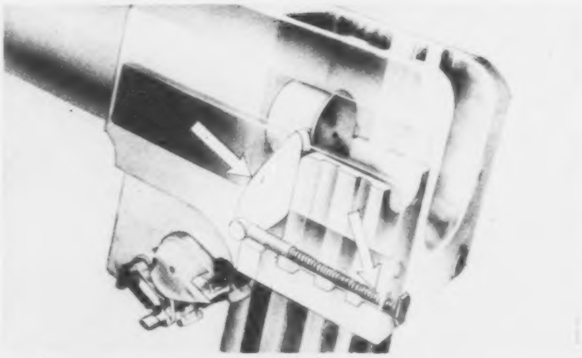
DISASSEMBLY AND ASSEMBLY OF BREECH MECHANISM

When the 3"/50 is fired the breech mechanism is subjected to severe stresses. It must be carefully and frequently inspected to make sure that no parts are in damaged or weakened condition.

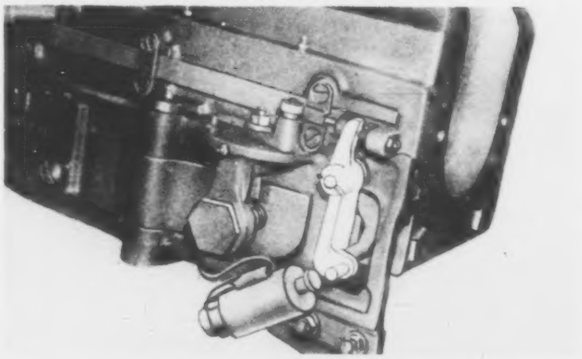
Because the gun is constantly exposed to the weather, the breech mechanism must be disassembled monthly to determine that no parts are in danger of "freezing" because of corrosion, improper lubrication, or the presence of foreign substances.



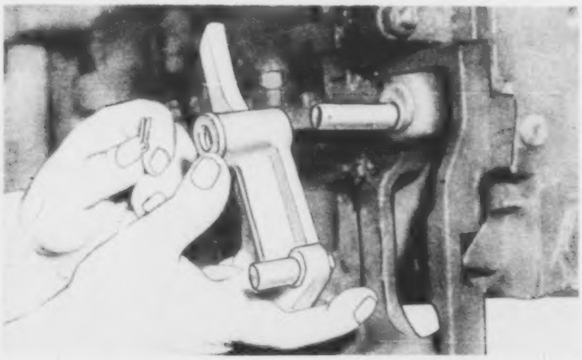
Some parts, like this extractor and extractor plunger assembly, are not readily accessible for inspection and cleaning. So, at the monthly inspections, the breech mechanism is disassembled. We're going to take it apart now, to see how to get to all the points where trouble can occur.

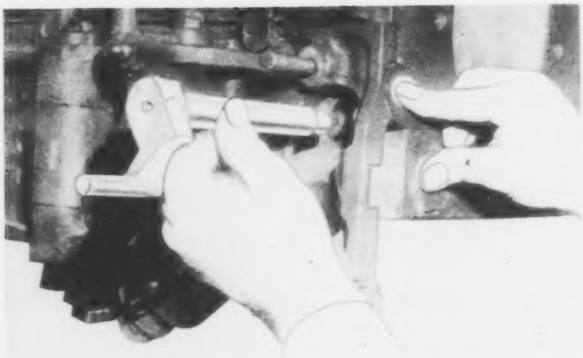


The trigger, located at the after end of the cam slide plate, comes off first.

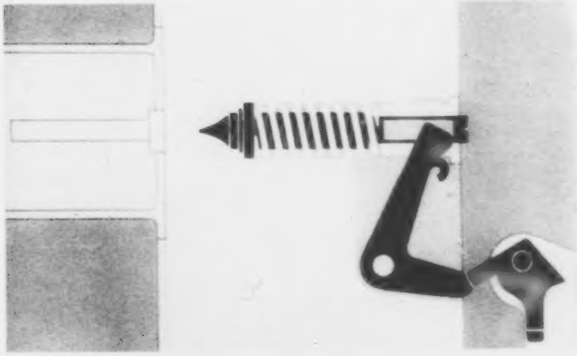


The trigger is slipped off its pivot pin after the cotter key is removed.

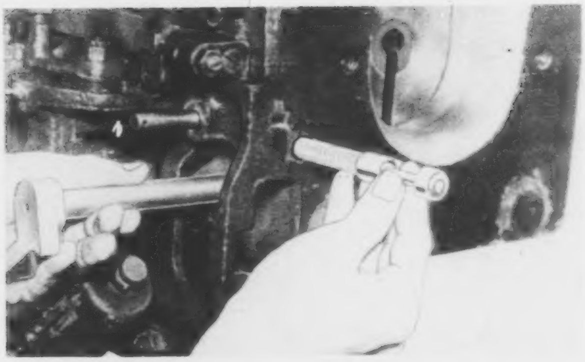




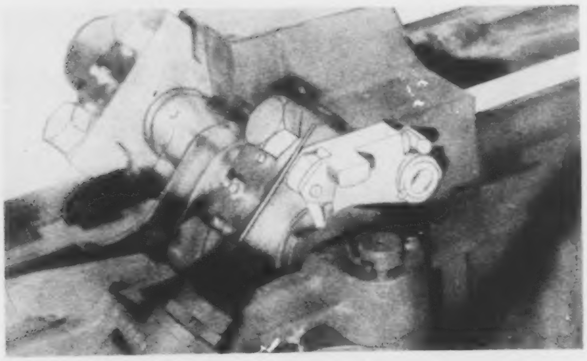
Now release the sear by pushing in the sear piston and drawing out the sear. This sear is not a part of the breech mechanism, and is removed to simplify the handling of the plug during disassembly.



If the sear were left in place, its nib would cause the cocking lever to compress the firing pin spring when the plug is raised, making it more difficult to pull the plug up during reassembly.

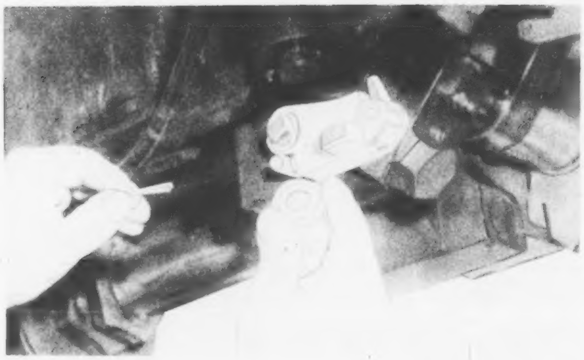


Once the sear is removed, the sear piston will be pushed out by its spring. Inspect the sear nib and the piston spring carefully.

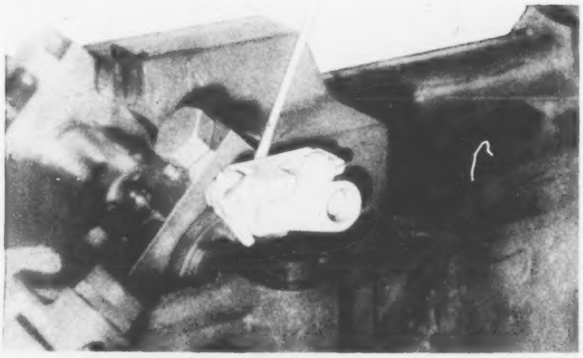


The salvo latch and other assemblies at the left of the operating shaft crank are next disassembled to permit the removal of the operating shaft.

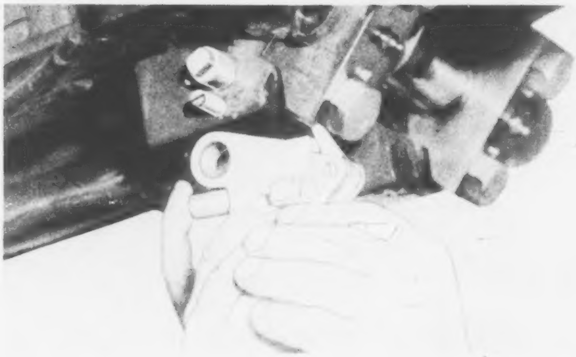
A cotter key and a washer are removed from the bearing stud of the salvo latch. When this is done. . .



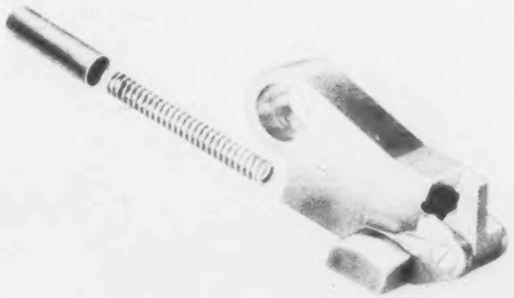
. . .the salvo latch is eased outboard on the bearing stud.

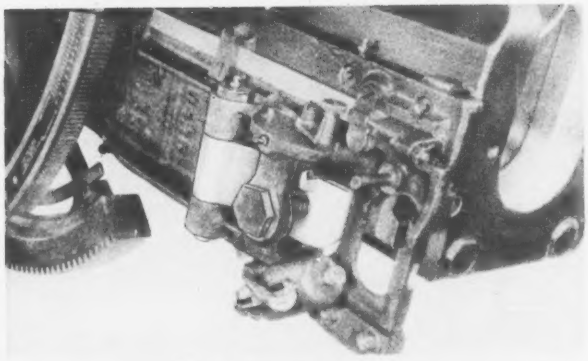


Note that a finger should be held at the end of the plunger as the salvo latch slides out of contact with the retaining pin. This prevents the plunger and spring from flying out of the latch.

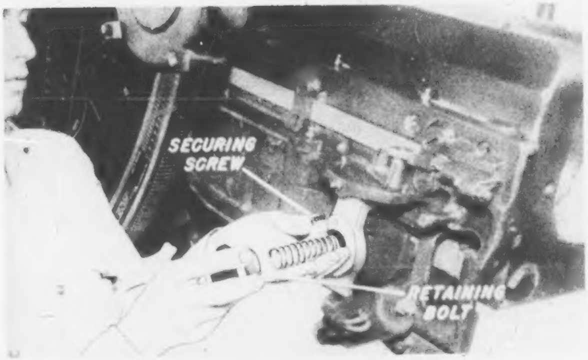


The plunger and spring are removed from the salvo latch. Inspect these parts and the latch bearing for wear and burrs. Also make sure the pawl works freely on its bearing.

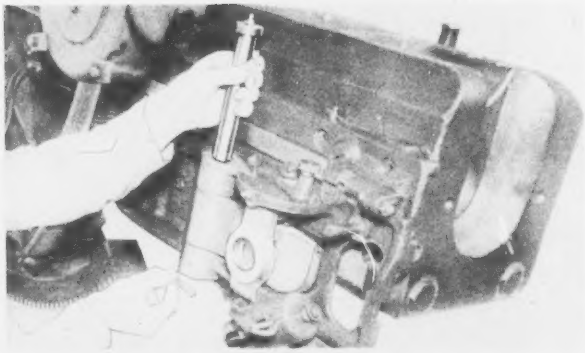




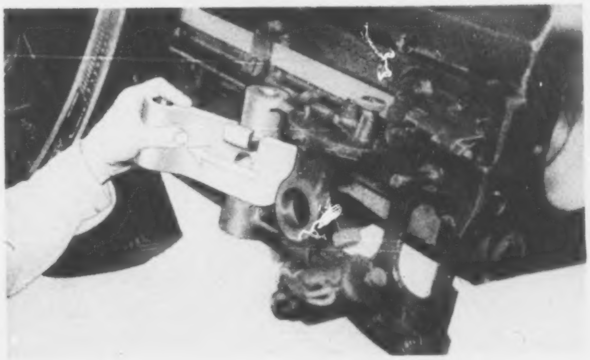
The operating shaft cam plate does not always have to be removed when the breech mechanism is disassembled, but it should be taken out occasionally to clean and check its bearing and spring. To remove the cam plate. . .



. . .first take out its securing screw and then remove the retaining bolt. This permits the cam plate spring to be withdrawn.

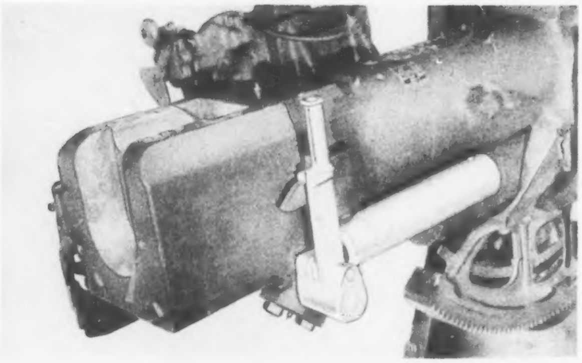


Pull the cam plate pivot pin up and out of its bearing. Don't forget the cotter key.

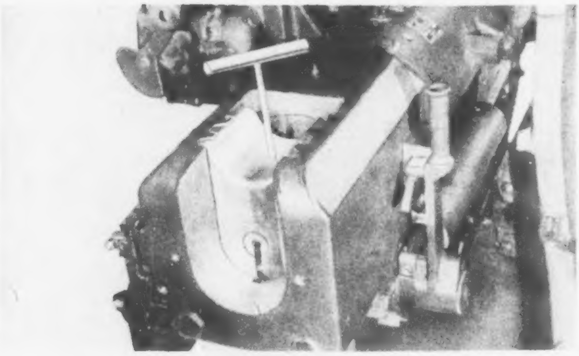


The cam plate is then pulled forward out of its bracket and is carefully inspected for burrs on the cam surface. This completes the disassembly of all parts to be removed, at the left end of the operating shaft. Moving now to the right side of the gun. . .

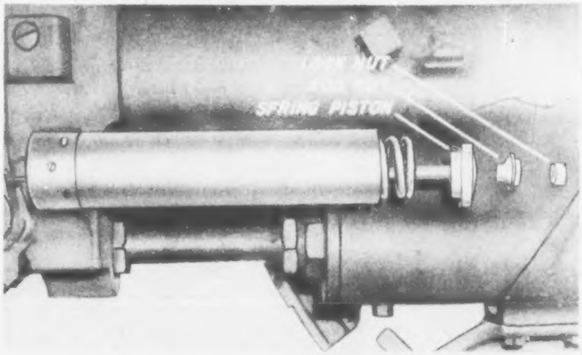
. . .we come to the hand operating lever and the operating spring. Since these parts control the movements of the breech plug. . .



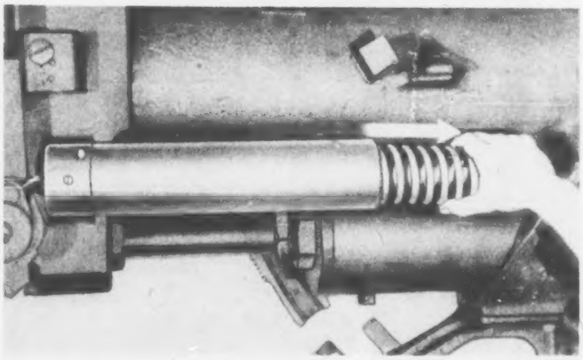
. . .a dismounting tool is screwed into the top of the plug, so that the plug may be held up by hand until it is ready to be lowered and removed from the breech housing. After this. . .

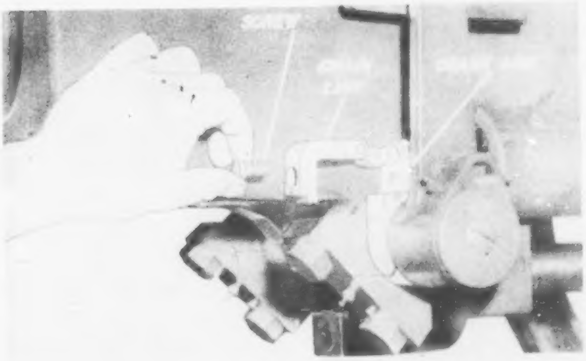


. . .the lock nut and rod nut that hold the spring piston against the operating spring are unscrewed. This relieves the tension on the spring. . .

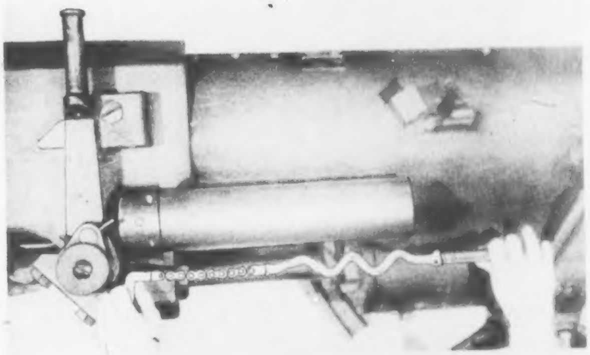


. . .which is then removed from the forward end of the housing. At the after end of the housing. . .

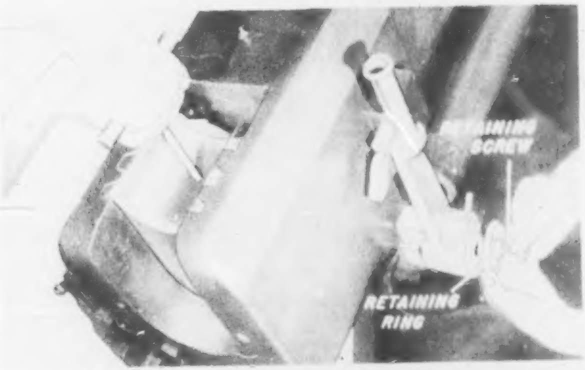




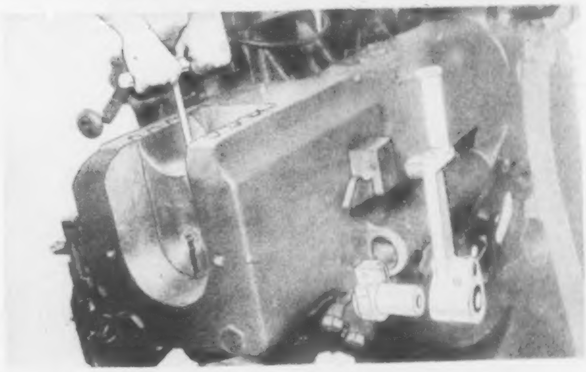
. . .removal of a set screw releases the chain link from the crank arm. This link is then pulled aft until. . .



. . .the operating chain and piston rod have been removed from the housing. Coming now to the hand operating lever. . .

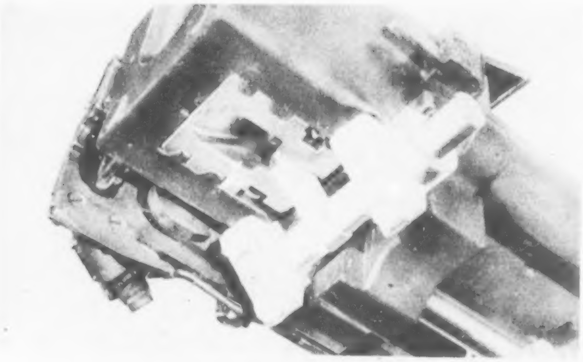


. . .taking out the retaining screw from the end of the right bearing on the operating shaft will permit removal of the retaining ring. It's a good idea, if you want to keep your toes from getting mashed, to hold the block up during this operation.

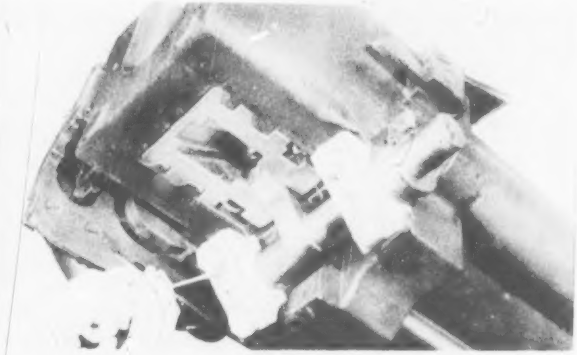


We can now slip the hand operating lever off the operating shaft and we are ready to remove the operating shaft itself. Let's examine this shaft, as we see it. . .

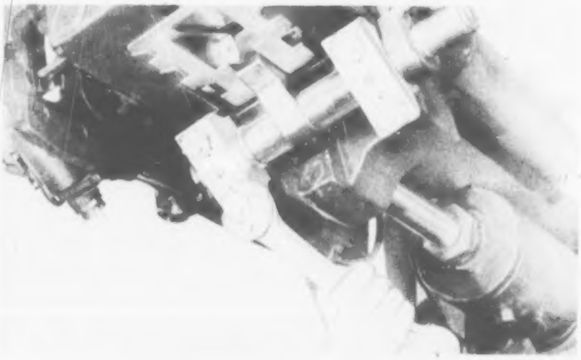
. . .from the underside of the breech housing. The shaft is secured to the breech housing by two bearing caps. To remove the caps. . .



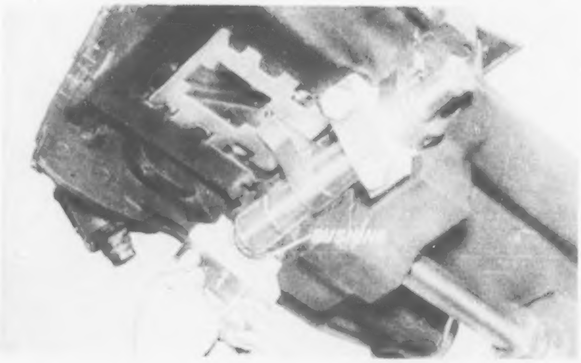
. . .first take out four securing screws, which prevent the cap-securing bolts from turning. With these screws out. . .

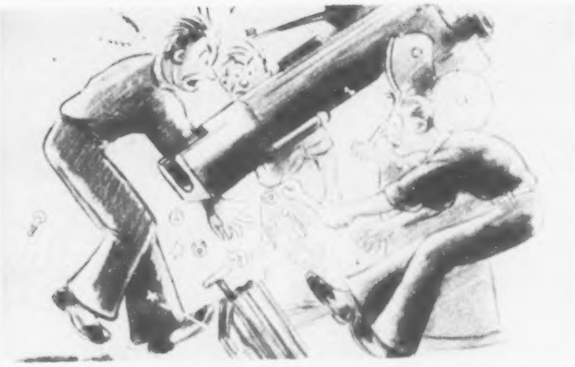


. . .the cap-securing bolts can be removed. Each bolt is numbered to permit its return to the same location in reassembly. At this point another man should help to support the shaft until it can be removed.

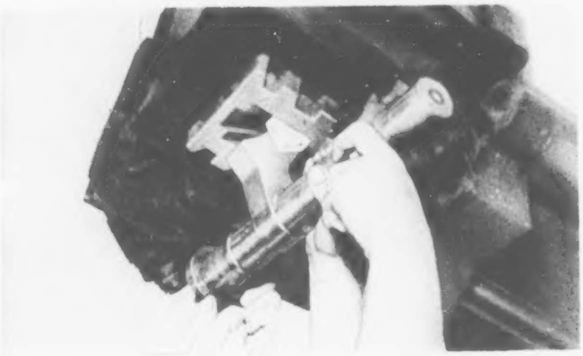


The bronze bushings can be inspected by first removing the two bearing caps. See that the bushings don't drop out when you do this. Inspect the bushings for scratches and for gummed lubricant or foreign matter. We're ready now to remove the operating shaft.

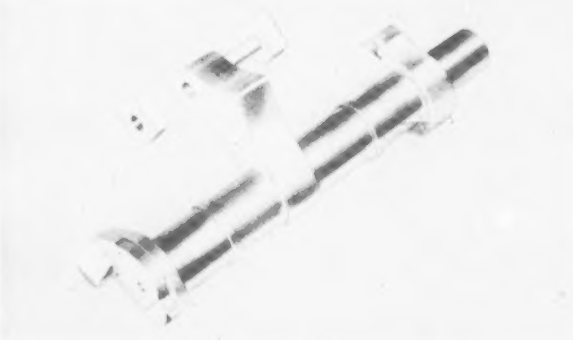




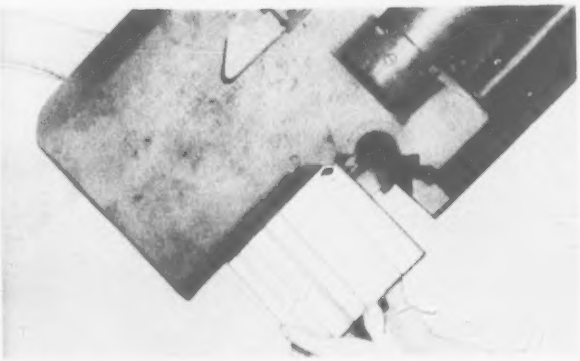
If the man holding the block with the dismounting tool isn't on the job, block, operating shaft and a few more parts will fall to the deck.



The two bearing blocks in the central arm of the shaft must be eased carefully out of the plug camways. Take care that these blocks do not fall from their pin.

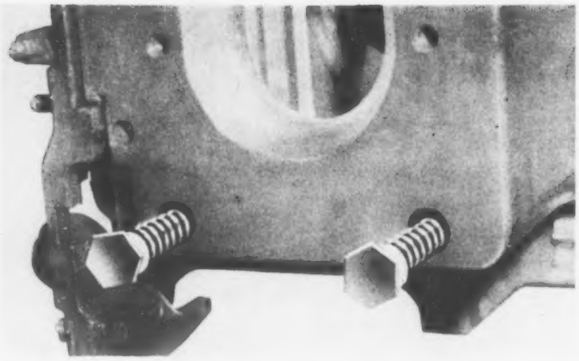


After the operating shaft has been removed, the bearing blocks and pin are taken from the central arm. Stone down any burrs you find on these parts. Do the same for all bearing and cam surfaces on the shaft.



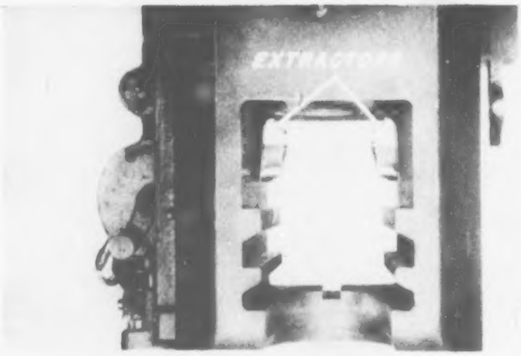
The block is lowered and is removed from the breech housing.

Each of the two extractor spring plugs is screwed out to permit removal of the springs and extractor plungers.

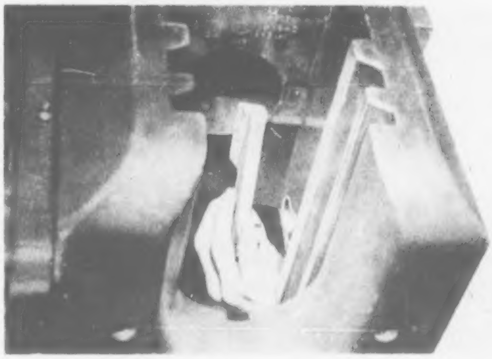


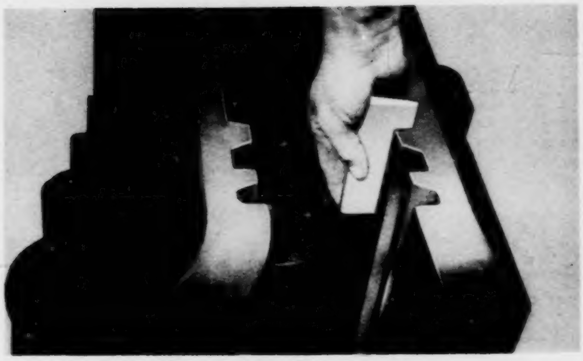
Each plug, spring and plunger must be checked to make sure it is not worn excessively. If the spring is weak, replace it.

The extractors now may be removed from the breech housing. . .

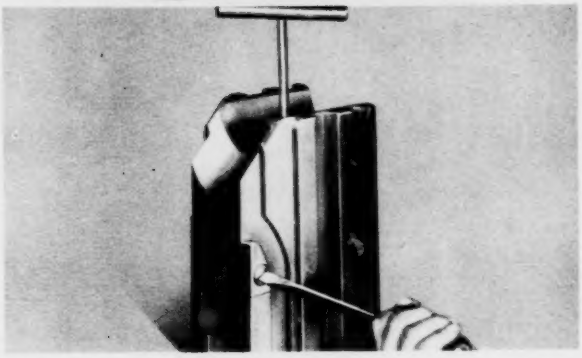


. . .by slipping each of them inboard, and disengaging the outer lug from its kidney-shaped slot.



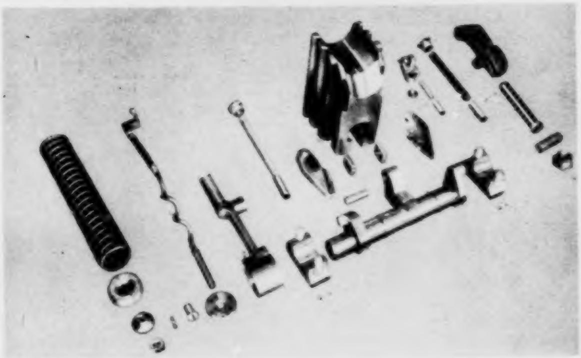


Inspect the guide grooves in the breech housing for burrs or foreign matter. They must be stoned down if any burrs are discovered. Dirt and foreign matter should be completely cleaned out.



If the pallets on the plug are worn, they shall be removed and replaced with new ones.

While inspecting the extractors and the block, pay particular attention to the extractor lugs and to the camways and guide grooves of the block.



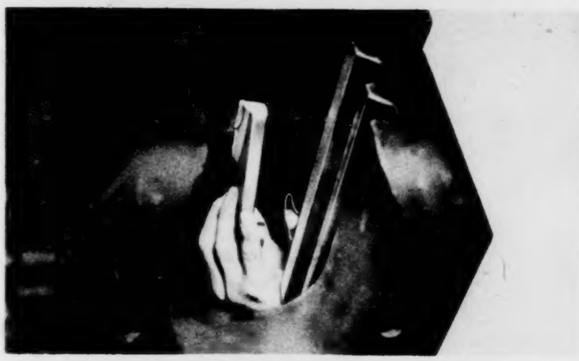
Here are all the parts of the breech mechanism that have been removed from the gun. Clean and lubricate all these parts carefully, and renew any that are found to be defective. After this we can begin reassembly.

2

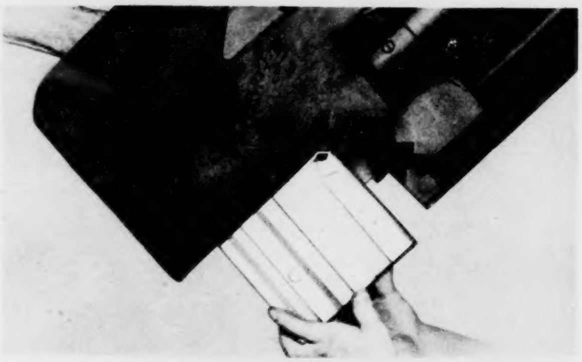
TITLE FRAME (REASSEMBLY)

REASSEMBLY

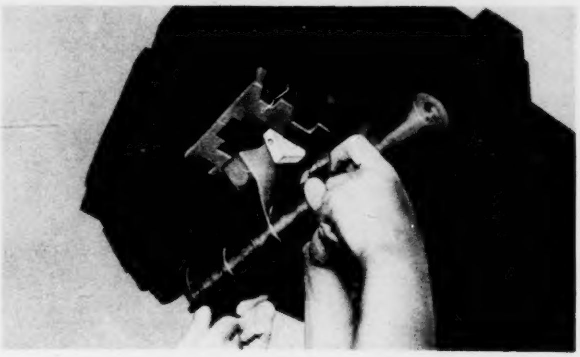
Replace each of the extractors, seating its outer lug in the kidney-shaped slot with the lip aft to permit the inner lug to engage the plug camway, when the breech block is replaced.



The block is placed in the breech housing by two men; one man holds it with the dismounting tool, the other man pushes it up from below. During this operation make sure the extractor inner lugs engage the camways of the block. The block must be raised all the way before we begin replacement of the operating shaft.

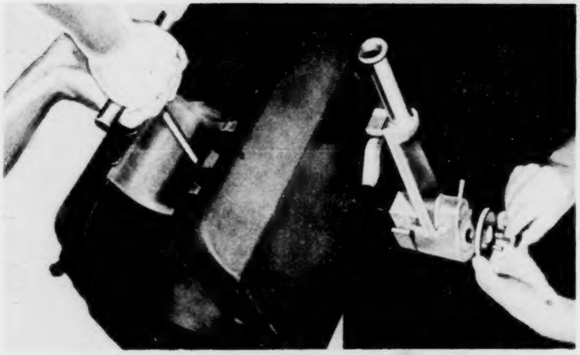


The bearing blocks are placed on the central arm of the operating shaft so that the oil holes face aft and up. The blocks are then guided up into the plug camways, and the operating shaft is seated in the upper halves of its bearings.

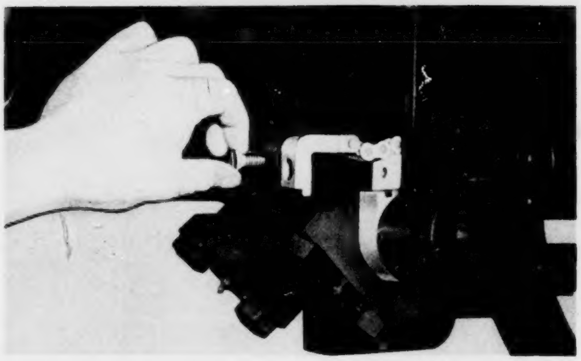


In reassembling the bearing caps, make sure the proper bronze bushing is in each cap. These caps are numbered 1 and 2 to match numbers on the breech housing and to assure that each cap is in its proper position.

When tightening the bearing caps draw the four cap securing bolts up evenly, and a little at a time, to prevent the shaft from binding. Then screw in the four securing screws to lock the cap-securing bolts. We move now to the right side of the gun...

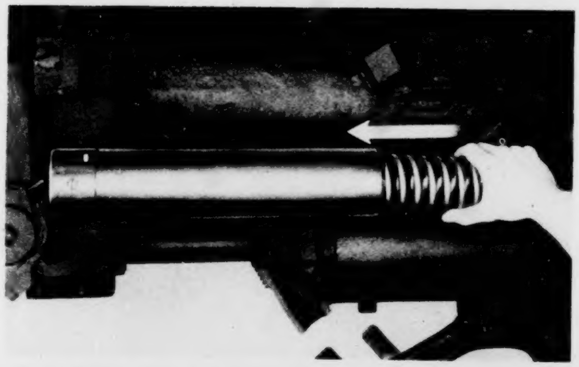


...to install the hand operating lever, which is secured by its retaining ring and retaining screw.

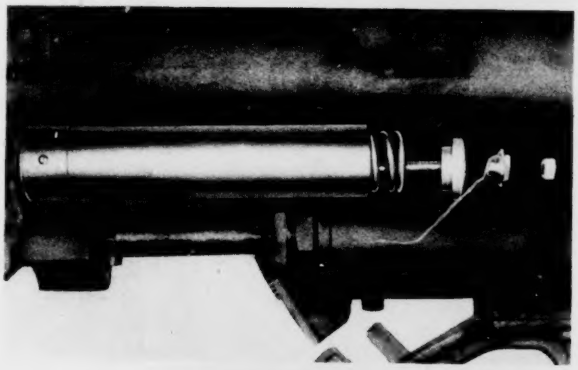


The set screw secures the chain link to the crank arm, after the operating spring piston rod and chain have been slipped into the housing.

The operating spring is inserted into the housing from the forward end...

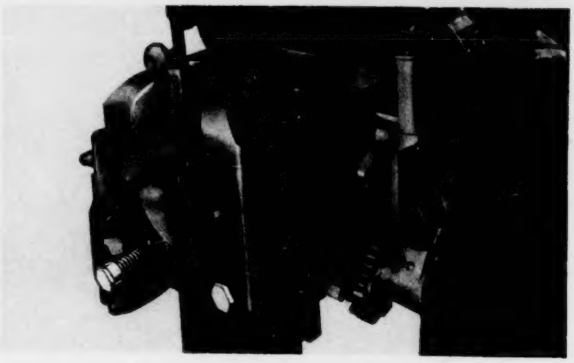


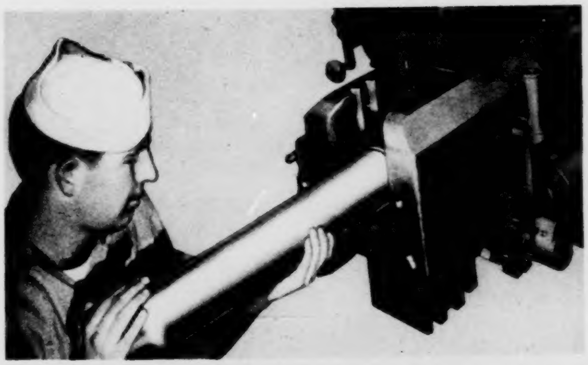
...and is secured by the spring piston and rod nut, and lock nut. With the hand operating lever in its "up" position, the rod nut is drawn up until the spring has sufficient compression to support the block. The dismounting tool should now be unscrewed from the breech block.



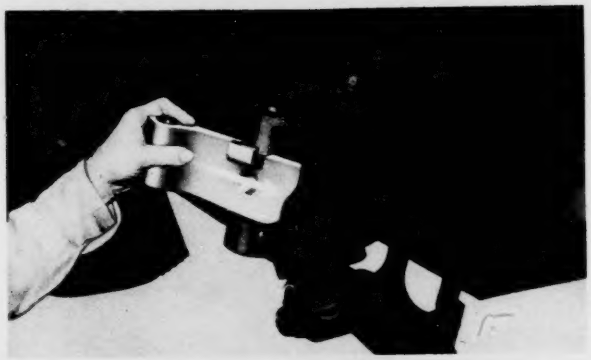
We're now ready to install the extractor springs. As a preliminary step, lower the breech plug. This will carry the extractor lugs forward, so as to cause the least compression of the springs.

Replace the extractor springs and plungers and secure them with the extractor spring plugs.

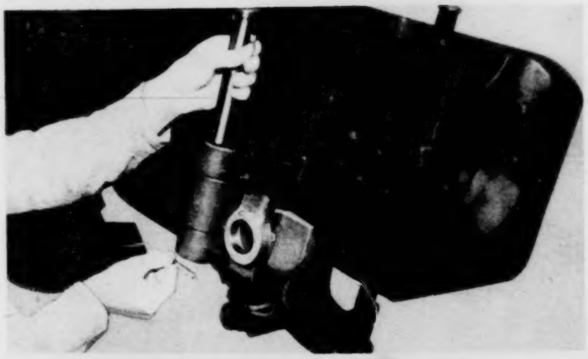




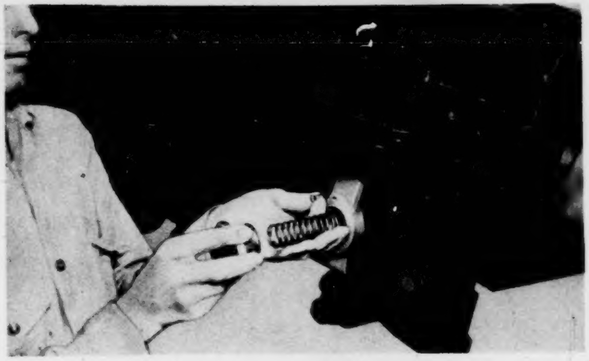
With the rim of a test case trip the extractors to raise the plug. Now, we move again to the left side of the gun.



The operating shaft cam plate is slid aft to its normal position, in which it is held...

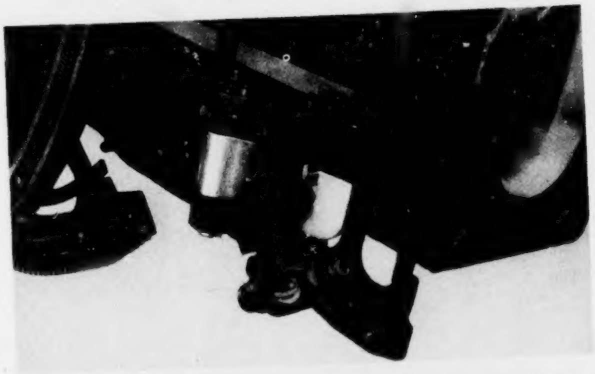


...when the cam plate pivot pin is pushed down into its bearing. Secure the pin in place with a new cotter key.

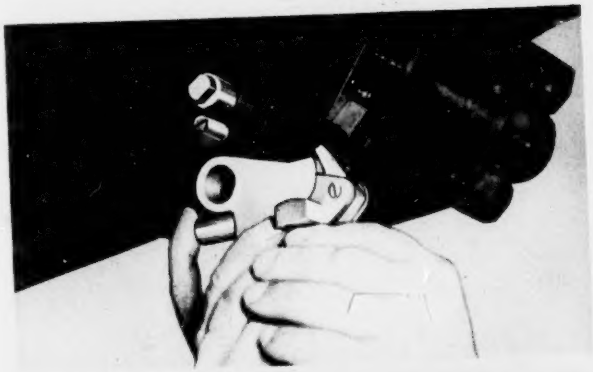


The cam plate spring is returned to place and is put in compression by the retaining bolt, which is locked in position by its securing screw.

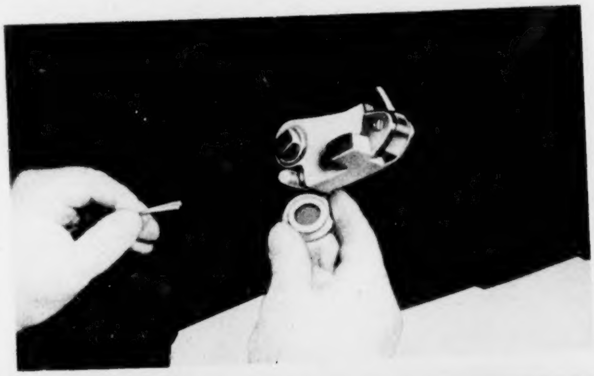
The operating shaft cam plate is now completely reassembled, and we move a little below it, to the bearing stud of the salvo latch.



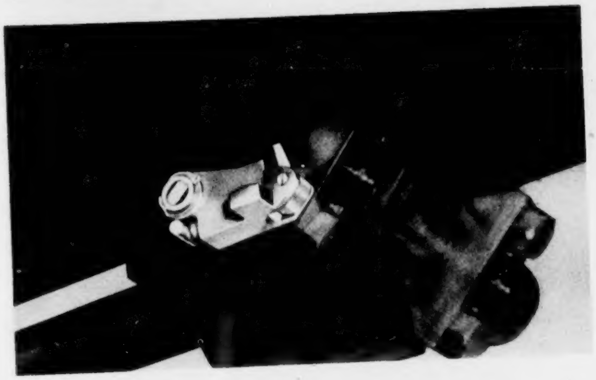
The salvo latch is mounted over the bearing stud. As the latch is being installed, hold a finger against the spring-loaded plunger, to prevent it from flying out, until it bears against the retaining pin.

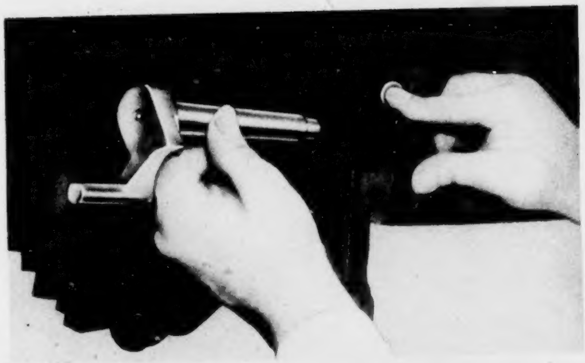


Replace the washer and cotter key on the bearing stud...

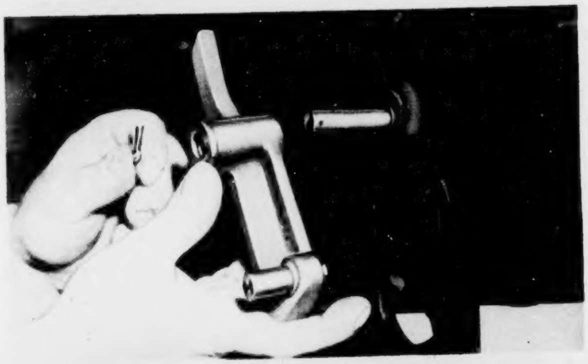


...to complete the assembly of the salvo latch.

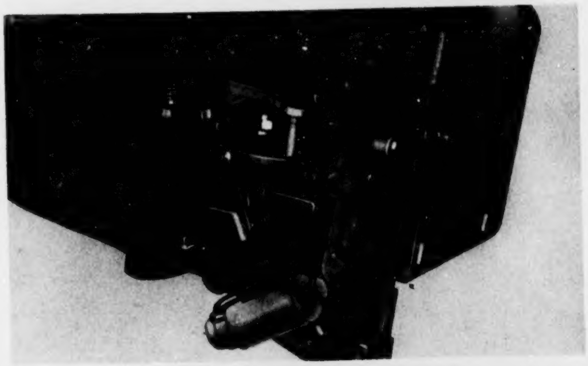




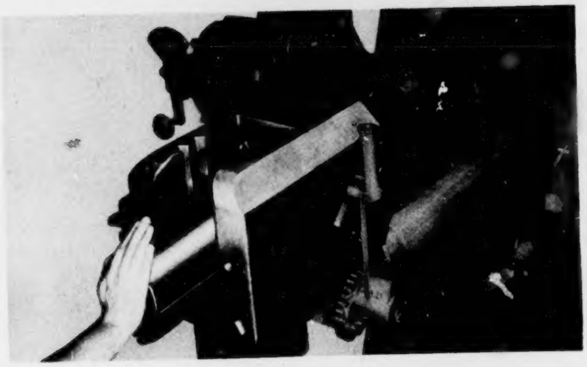
Install the sear piston and then the sear. This is slid into its mounting hole while the sear piston is held inward. When the sear piston is released the sear is again under the control of the piston spring.



Re-assemble the trigger and secure it with the washer and cotter key.

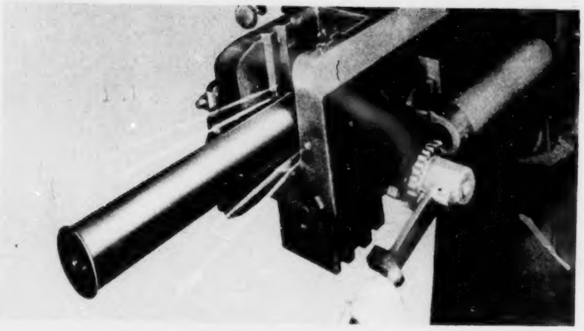


The breech mechanism is now completely reassembled. If you've done your work properly, it should be in top condition and ready for instant use. To make certain it is, lower the breech block and perform this simple test.



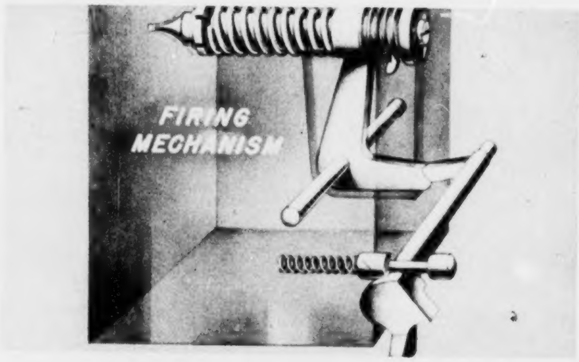
Ram a test case into the breech in the usual way. This should cause the plug to rise and the salvo latch to engage the operating shaft crank. If the plug does not rise smartly, take up on the operating spring rod nut, a few turns at a time, until it does. Now trip the salvo latch by hand...

. . . and lower the block with the hand operating lever, to see that the case is properly ejected. If the case is ejected properly, you've done your job well, and the gun is ready for action.

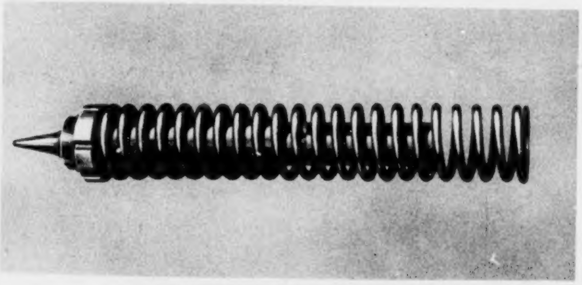


DISASSEMBLY AND REASSEMBLY OF THE FIRING MECHANISM

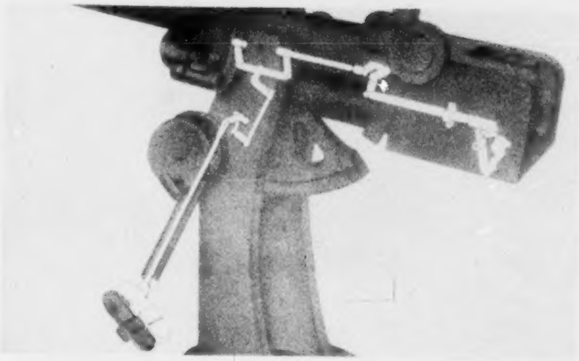
The firing mechanism of the 3"/50 must be disassembled frequently to see that it is free of burrs, foreign matter and corrosion.

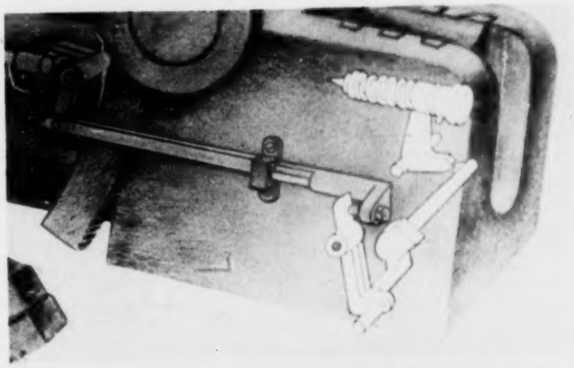


If a defective firing pin spring or any other damaged part is detected, the firing mechanism must be disassembled and the part replaced.

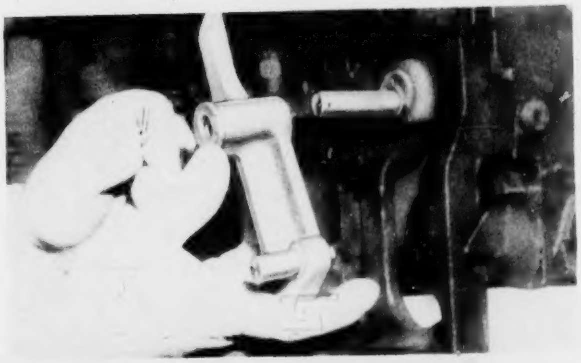


The foot firing mechanism may bind or jam because of corrosion–and gunner's mates must occasionally disassemble the linkage to clean and repair it. In this course we are going to study the disassembly of this linkage and of the firing mechanism.

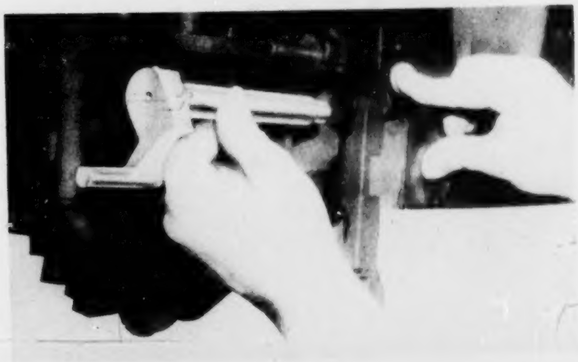




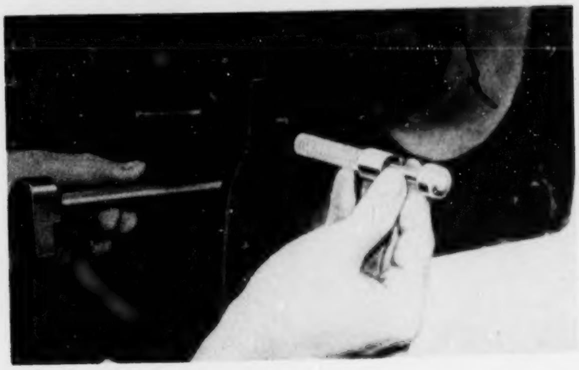
Disassembly of the firing mechanism begins at the left side of the gun. Before starting disassembly, raise the breech block and uncock the firing pin with the trigger.



Next, remove the trigger from its pivot pin, after a cotter key and washer have been taken off.

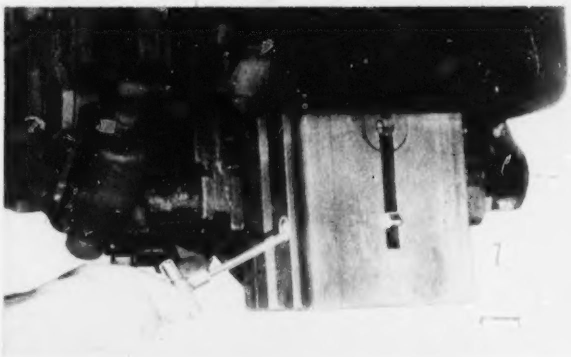


The sear is slipped out of the breech housing after the sear piston has been pushed inboard. Inspect the sear nib for burrs and excessive wear.

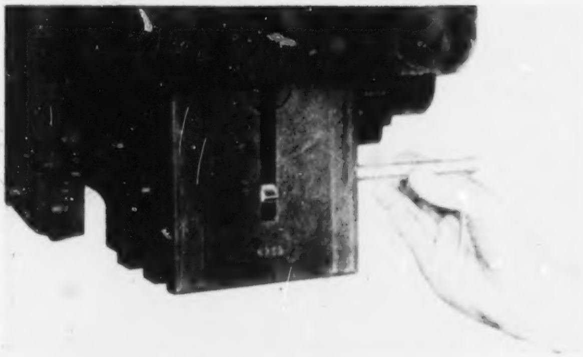


Then remove the sear piston. See that it is free of corrosion and foreign matter and that the spring is in good condition.

With the block lowered push the pin which supports the cocking lever to the right with a recocking tool...

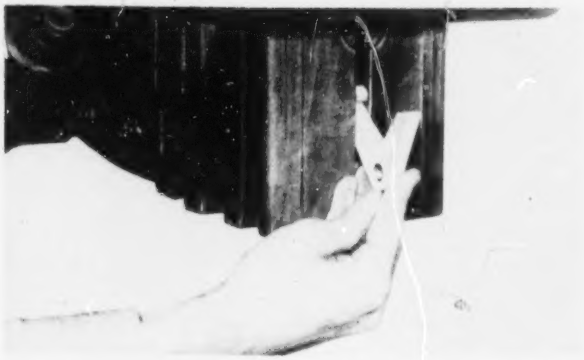


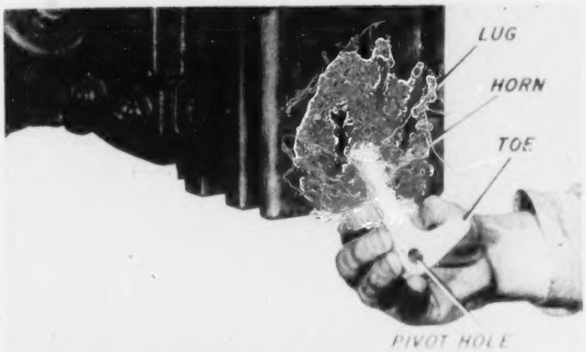
...and remove it from the right side of the block.



The cocking lever pin must be inspected for breaks and excessive wear–and replaced, if necessary. With this pin out...

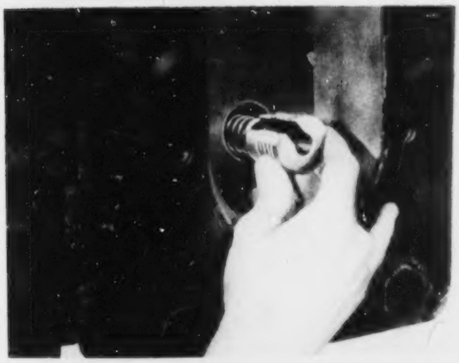
...the cocking lever is removed from the slot in the breech block...





...and the lug, horn, toe and pivot hole are inspected for breaks, burrs and wear. Now the breech block is raised...

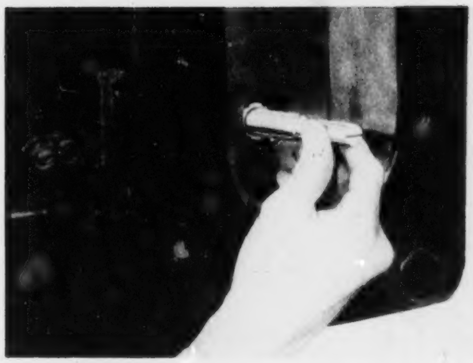
...and the cocking lever is used to unscrew the firing pin bushing from the block.



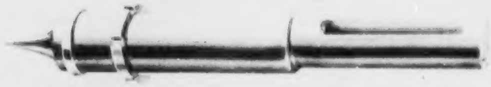
Check the bushing to see that the threads are in good condition and that there are no burrs to interfere with the action of the firing pin.

Now remove the firing pin spring. If it shows any cracks or sign of wear, replace it.

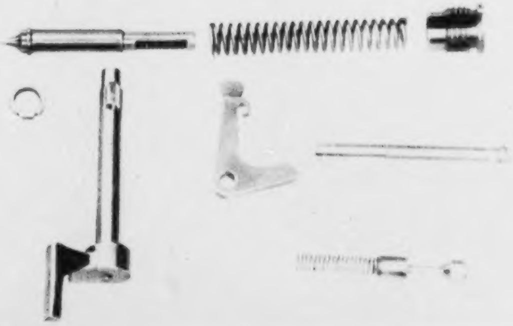
The firing pin is the last part of the firing mechanism to be removed from the plug. The cavity in the plug is then cleaned out and lubricated.



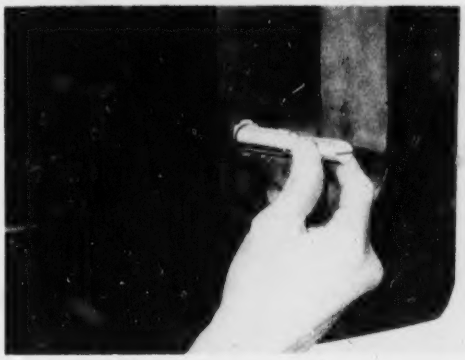
See that the striker point of the firing pin is in good condition and that there are no cracks along the slotted section. Remove and inspect the washer.

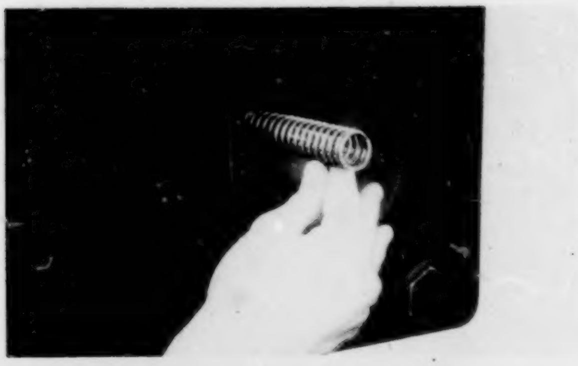


All of these parts of the firing mechanism, must be carefully cleaned and lubricated. They may then be reassembled.

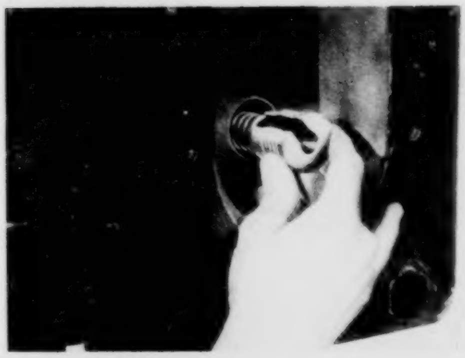


The replacement of the firing pin and washer in the breech plug is the first step in reassembly.

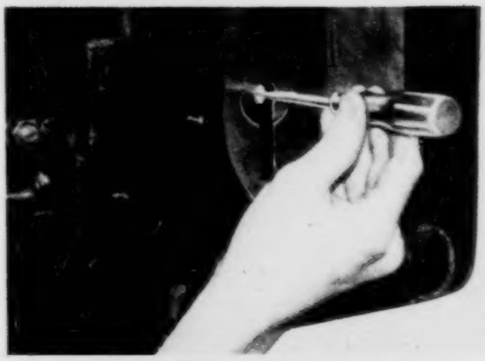




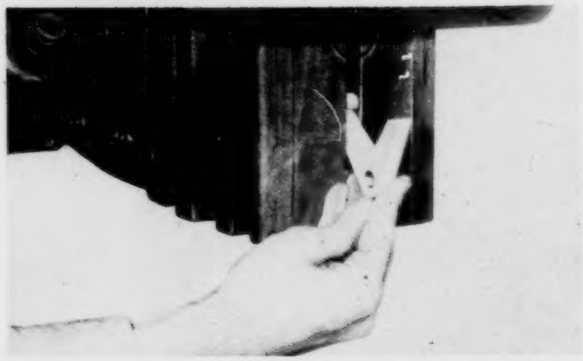
The firing pin spring is then slid into the block, around the firing pin.



The firing pin bushing is pressed against the spring and turned by hand until its threads engage the threads in the breech block. After this, the bushing is screwed in with the cocking lever. Screw it in as far as it will go, and then back off a little until its slot lines up with the slot in the block.

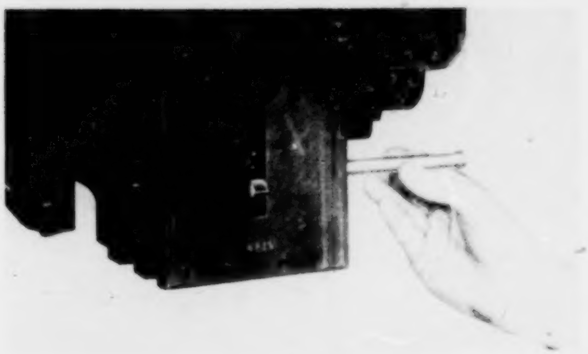


Turn the slot at the end of the firing pin to the horizontal position with a screw driver. This lines up the long slot in the body of the firing pin to receive the lug of the cocking lever. Now lower the block. . .



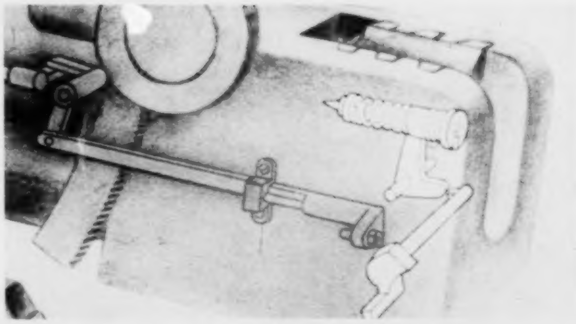
. . . to permit replacement of the cocking lever. As the lever is being set in, engage the lug at its upper end in the firing pin slot.

The cocking lever pin is then pushed, from the right side, into its hole in the plug and through the pivot hole in the cocking lever. Now raise the block.

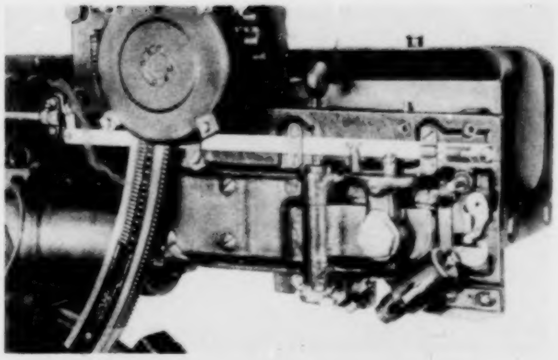


Slide the sear into its hole in the breech housing while holding the sear piston inboard against its spring with your finger. Release of this finger pressure causes the piston to hold the sear in place.

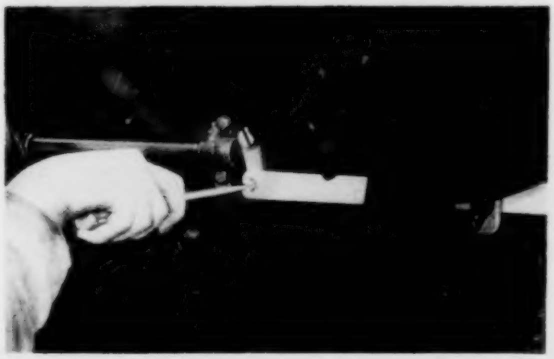
All the parts of the firing mechanism that were removed from the plug and the breech housing are now reassembled. The trigger has not been replaced on the cam slide plate, because we are about to begin the disassembly of the foot firing mechanism.



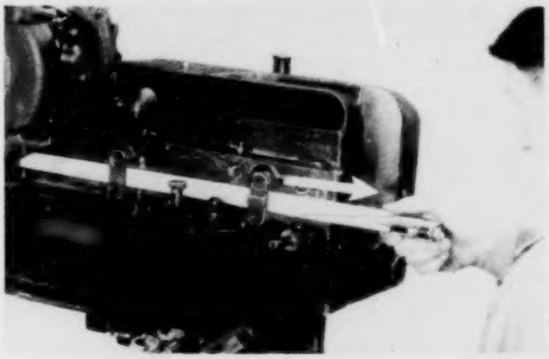
DISASSEMBLY *and* REASSEMBLY *of the* FOOT FIRING MECHANISM



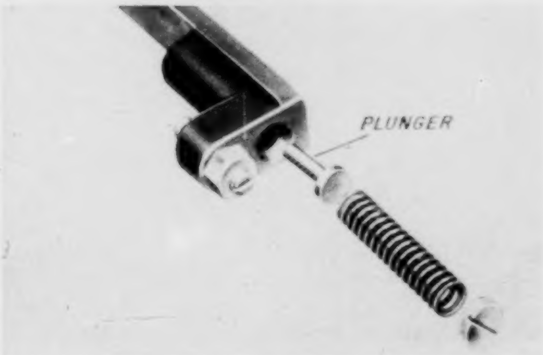
The trigger pull bar is the first part of the foot firing mechanism to be removed.



Free the forward end of the trigger pull bar from the vertical lever by removing a retaining screw...

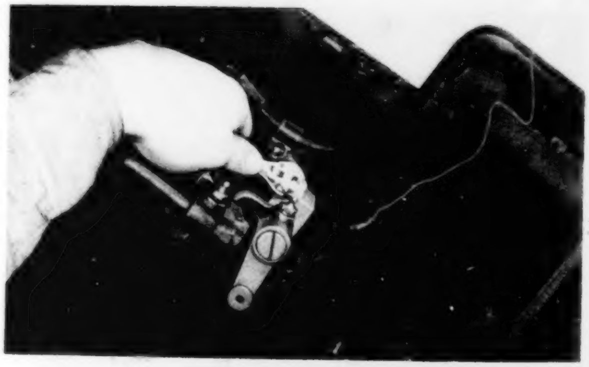


...and slide the bar aft.

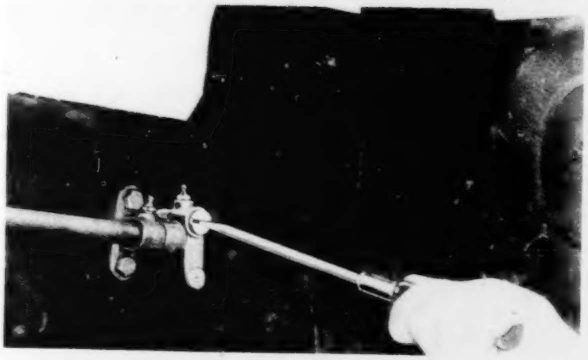


Remove the spring and plunger from their housing in the trigger pull bar. Clean and lubricate these parts and the hole in which they fit; then reassemble.

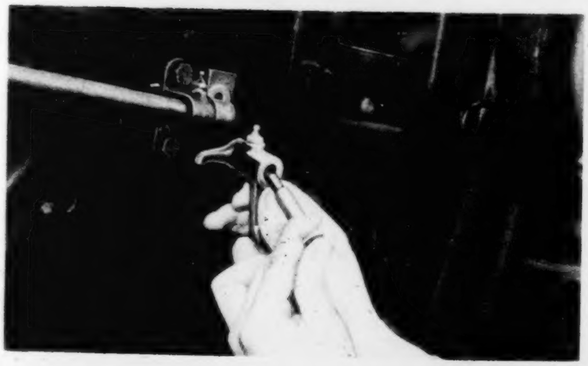
Coming back to the vertical lever, loosen the set screw over the pivot pin. . .



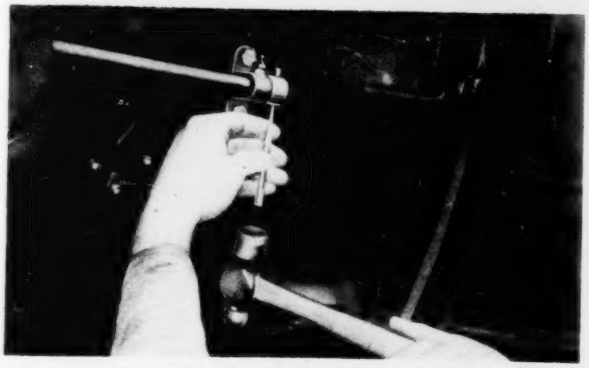
. . .unscrew the pivot pin, . . .

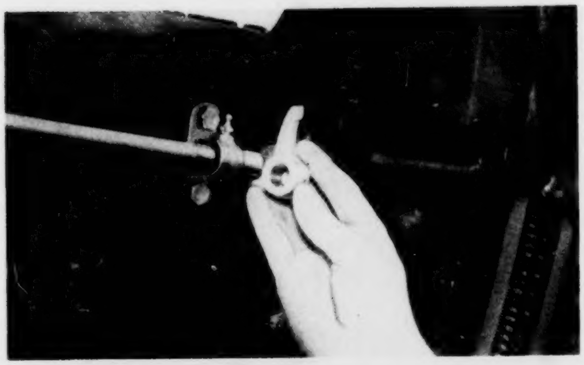


. . .and remove the vertical lever and pivot pin from the slide.

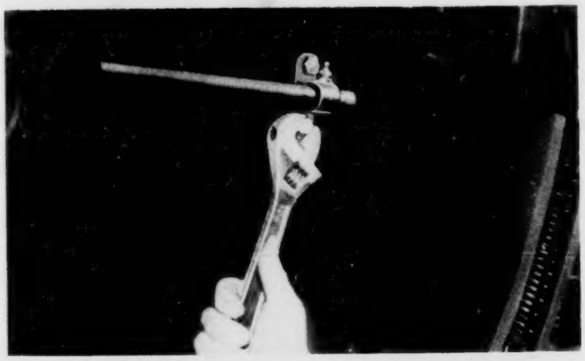


Drift out the taper pin that secured the horizontal shaft lever to the horizontal shaft. . .

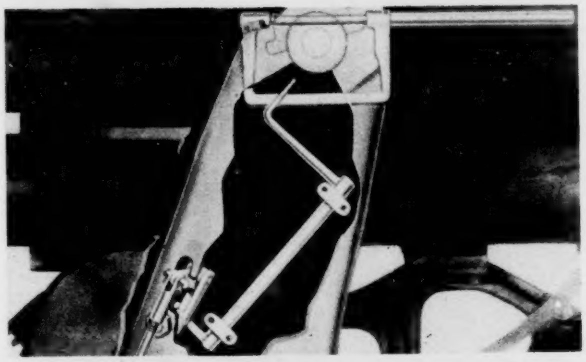




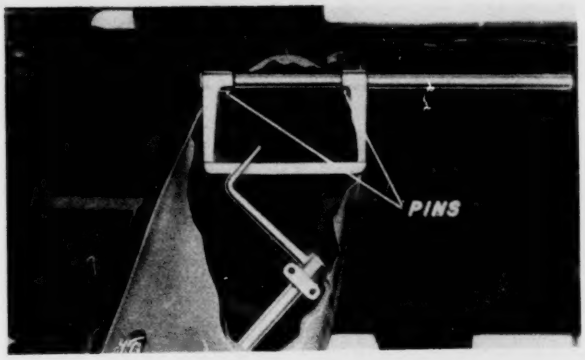
. . . and slip the lever off the shaft.



Unbolt and remove the retaining bracket which holds the horizontal shaft to the slide.

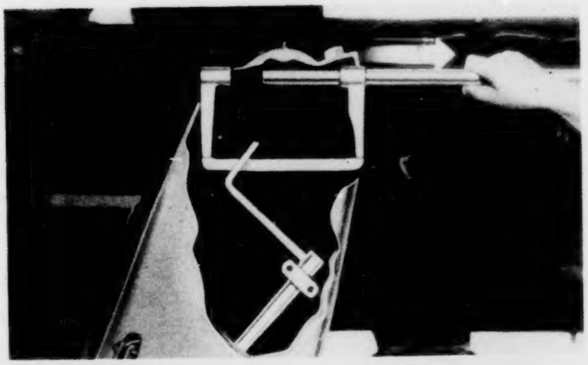


The next parts to be removed are located around the trunnion and on the inner side of the left carriage cheek. We shall use a series of cutaway views to show how parts behind the cheek are disassembled.

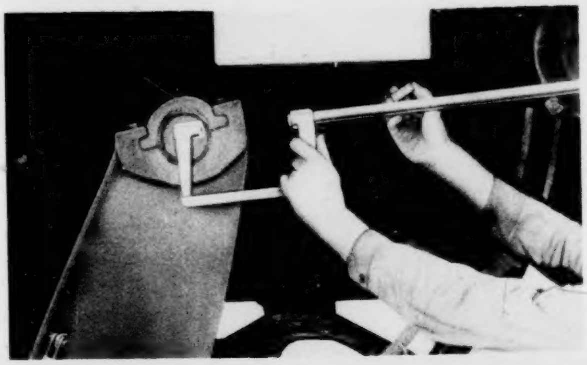


Two taper pins securing the horizontal shaft to the equalizing lever are drifted out from below. The horizontal shaft is then. . .

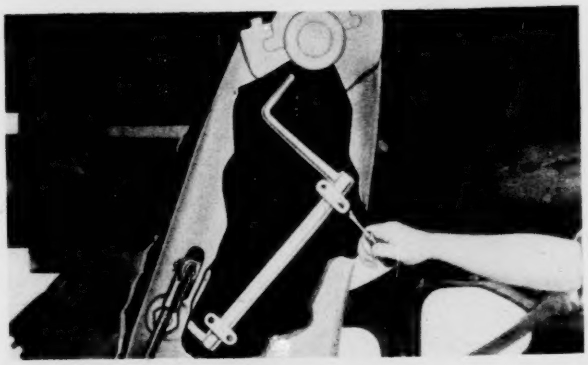
...pulled aft through the equalizing lever and trunnion.



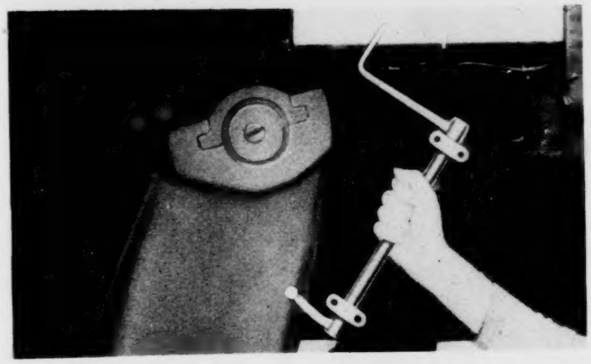
The equalizing lever and its spring are then removed.

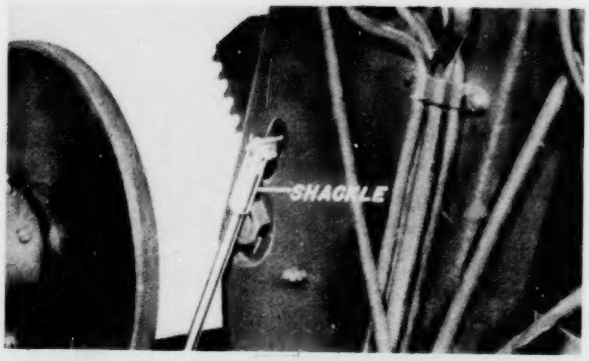


Two retaining lugs are unscrewed from the inner side of the carriage cheek to free the upper lever, rotating rod and lower lever...

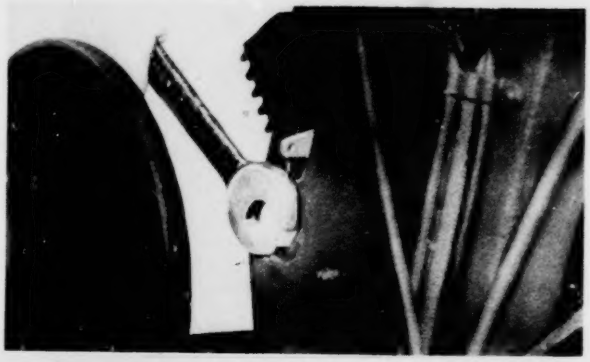


...so they can be removed, as a single part, from the carriage.

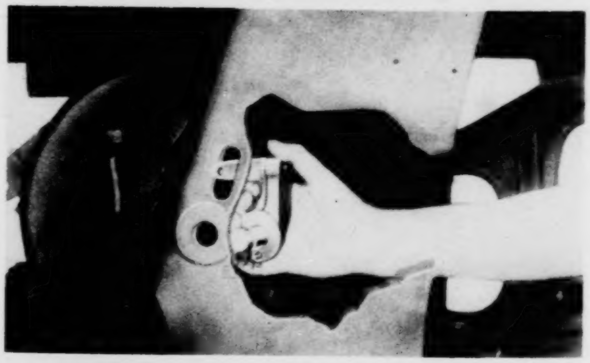




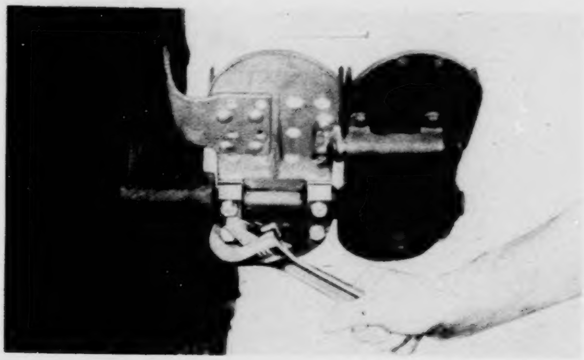
Now free the shackle at the upper end of the firing rod from the bell crank by removing a cotter key and pin. At the same time, a similar connection between the lower firing rod shackle and the treadle shoulder is broken and the firing rod is removed.



Then unscrew the bell crank bracket nut on the outside of the carriage, . . .

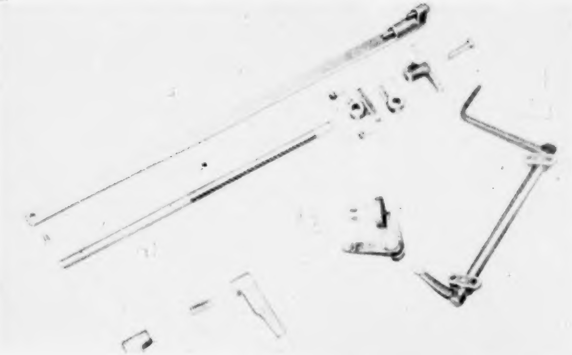


. . . and remove the bell crank bracket, with bell crank attached, from the inside of the carriage cheek. Inspect the bell crank for signs of corrosion.

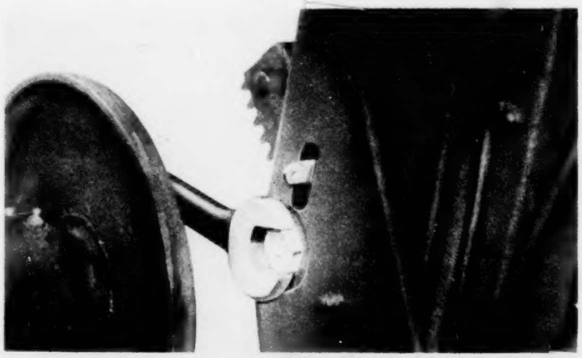


The treadle is removed by unscrewing the securing nuts from the cap squares that hold the treadle to the treadle pivot bar. Clean and lubricate the bearing surfaces and replace the treadle. Also inspect the safety latch, operated by the lug on the left footrest. See that it is cleaned and well lubricated.

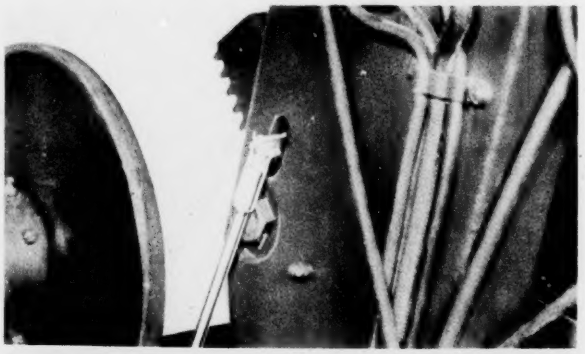
All the other parts removed from the foot firing mechanism must be cleaned and lubricated. Replace parts that show excessive wear and remove any burrs from bearing surfaces before beginning reassembly.



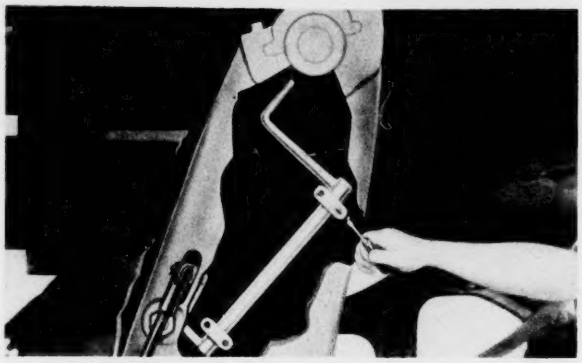
The first reassembly operation is securing the bracket to the inside of the cheek, by screwing on the bell crank bracket nut.

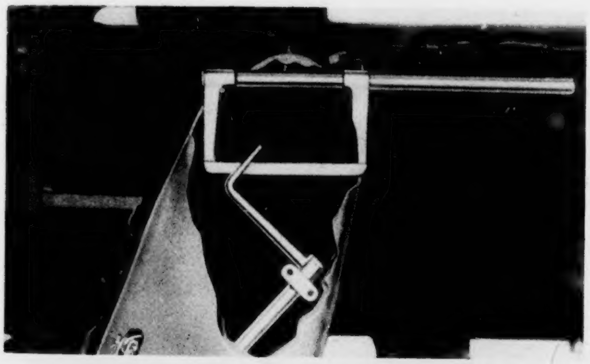


Next replace the firing rod by connecting its upper shackle to the bell crank arm with the pin and cotter and connecting its lower shackle to the treadle shoulder in the same way.

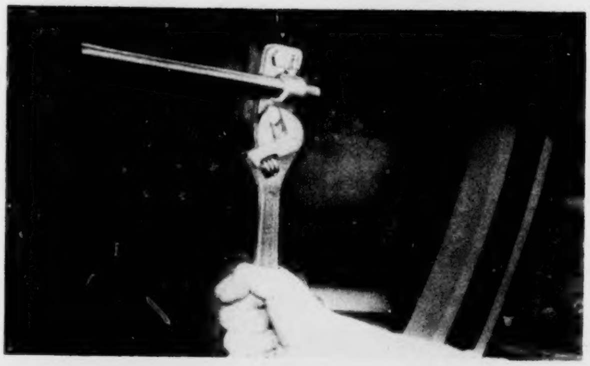


Mount the upper lever, rotating rod and lower lever on the inside of the cheek with the two retaining lugs.

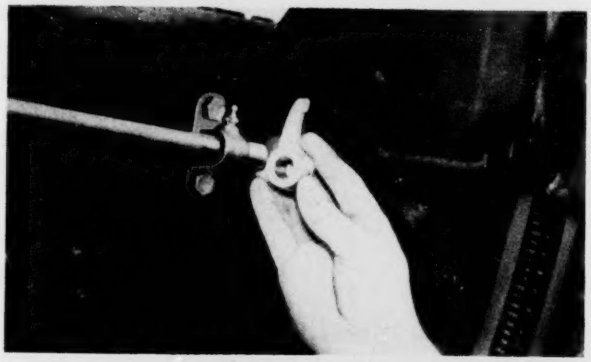




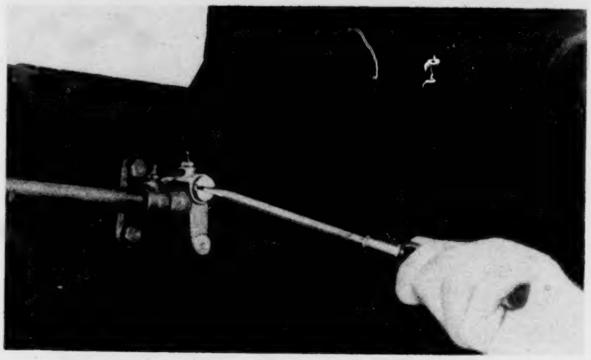
Replace the equalizing lever and horizontal shaft by pushing the shaft forward through the trunnion and lever, while holding the spring in place. Then drive in the taper pins from the top.



Bolt on the horizontal shaft retaining bracket.

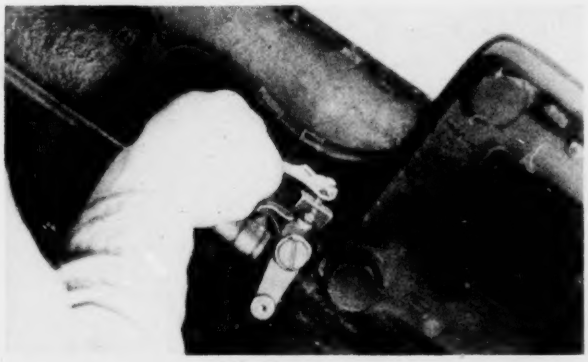


Replace the horizontal shaft lever on the shaft and secure it with its taper pin.

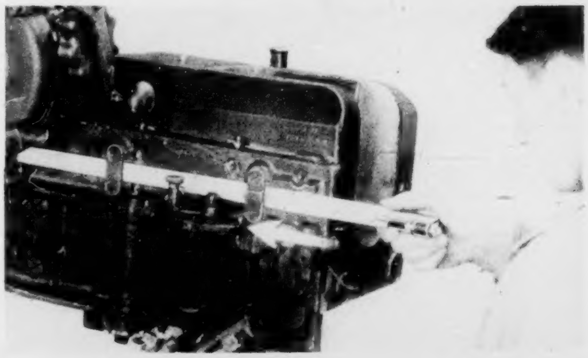


The vertical lever is installed by screwing its pivot into place...

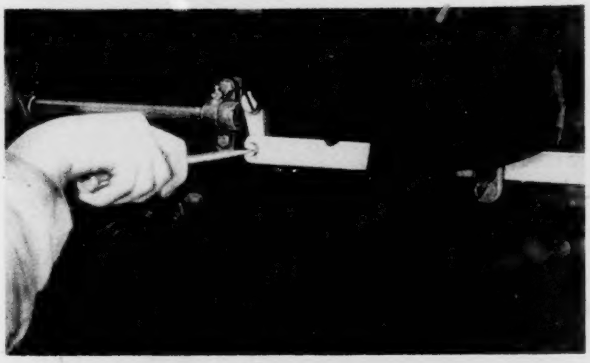
...and securing the pivot with the set screw.



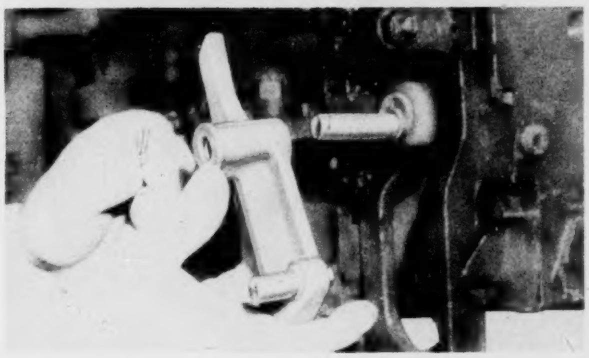
Next slide the trigger pull bar forward...

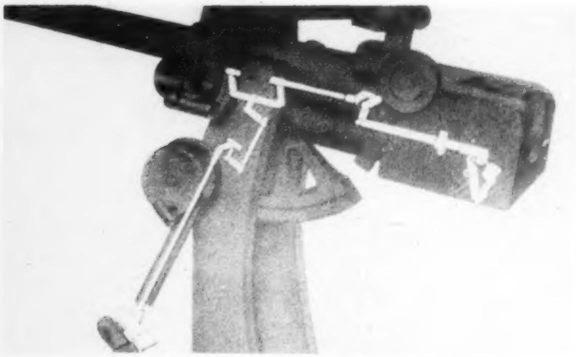


...and connect it to the vertical lever with the retaining screw.



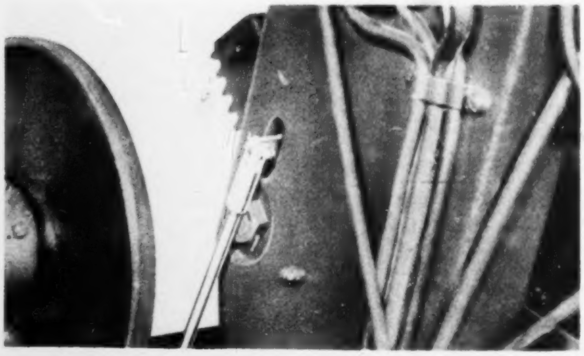
Slip the trigger over its pivot pin and set the washer and cotter key in place.



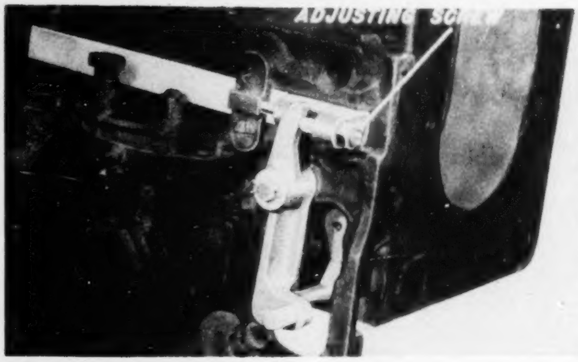


The foot firing mechanism is now completely reassembled. Try it out...

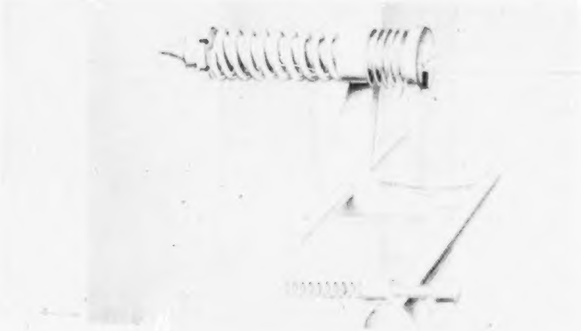
...by depressing the treadle to make sure it causes release of the cocked firing pin. Do this several times to determine if there is any lost motion between treadle and trigger. If any is present...



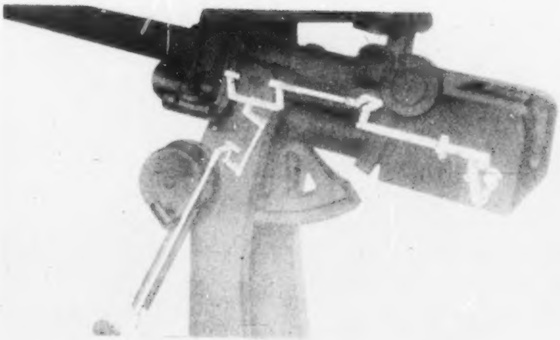
...screw the top shackle down on the firing rod, thus shortening the rod and removing play from the system. Then tighten the locking nut against the shoulder of the shackle.



The adjusting screw on the trigger pull bar must hold the trigger so that the lower trigger arm just contacts the sear lever lug, when the lug is completely forward. The adjusting screw is screwed in or out to provide this setting and the lock nut is then tightened. The foot firing mechanism is now adjusted to release the firing mechanism properly.

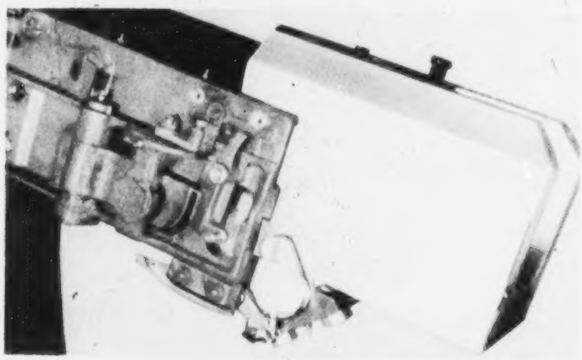


The firing mechanism should now respond instantly to the trigger, because, we freed its parts of foreign matter, burrs and corrosion—and replaced all defective parts. Keeping the mechanism in good shape is a matter of frequent disassembly and constant maintenance.

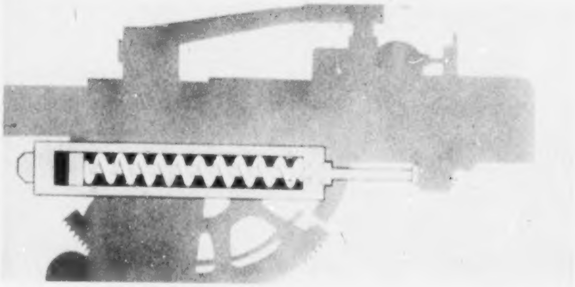


The foot firing mechanism must also be maintained and lubricated regularly. Then you can depend on it to respond quickly, whenever you need it.

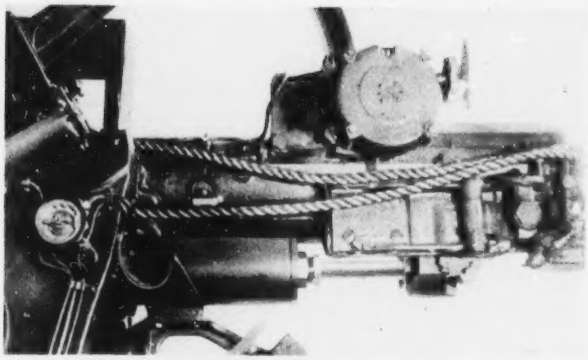
DISASSEMBLY AND REASSEMBLY OF THE RECOIL AND COUNTERRECOIL MECHANISM



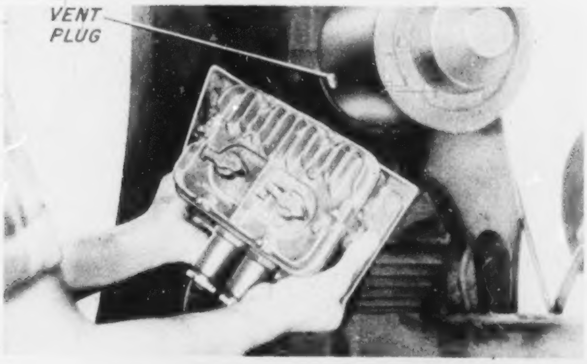
The recoil and counterrecoil systems of the 3"/50, not only throttle the tremendous force of recoil but also provide automatic operation of the breech mechanism. It is vitally important that the recoil and counterrecoil systems which control these movements are kept working properly at all times.



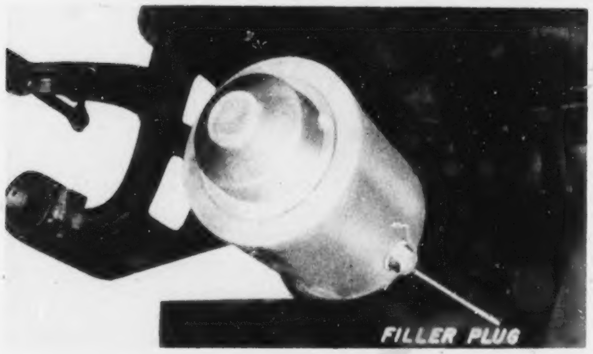
Occasionally, a spring may break or become weakened, and the only way to replace it is to disassemble the system. We're going to see how this is done. First, let's take a safety precaution.



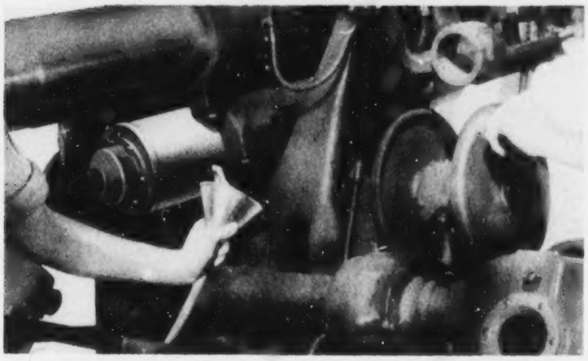
Pass a line around the after end of the breech housing and around the trunnion, to prevent the housing and barrel from running out of the slide after they have been disconnected from the piston rod. Allow enough slack to permit moving the housing about a foot aft. Now let's move to the right side of the gun.



Disconnect the lighting switch panel from its bracket so it will be out of the way. Then loosen the vent plug located toward the forward end of the recoil cylinder.

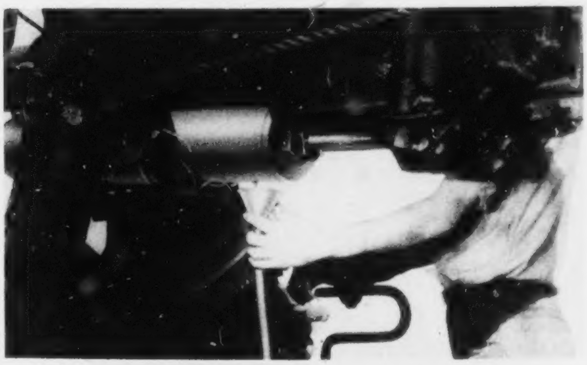


The filler plug on the left side of the cylinder is screwed out after the gun has been set at zero elevation. Then, through the filler hole,

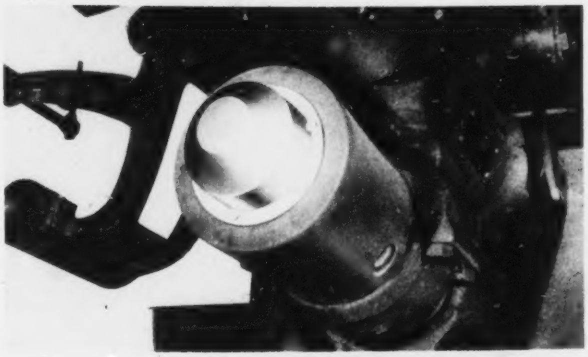


drain the recoil off into a container. The rate of flow of the liquid is easily controlled by elevating and depressing the gun.

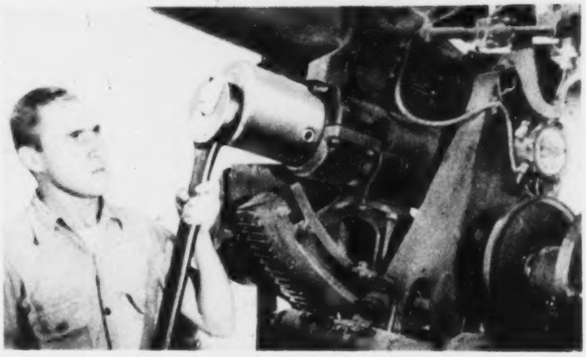
Remove the drain plug at the after end of the cylinder and drain off the small amount of liquid still remaining.



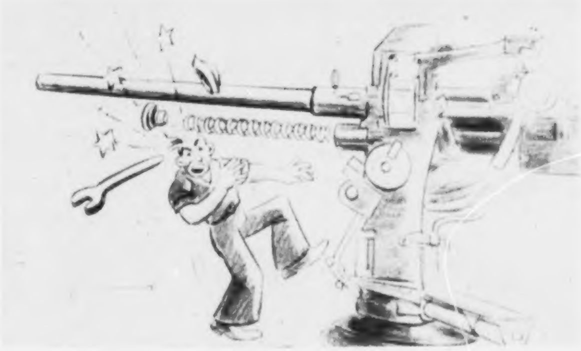
The needle valve cover plate at the forward end of the cylinder is next removed.

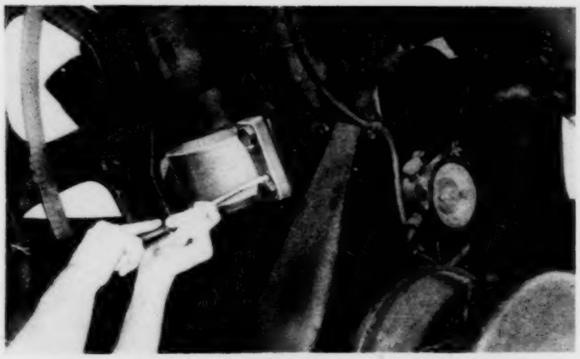


and the forward cylinder head is unscrewed about a half turn, just enough to start the thread, so that the head may be removed easily after the cylinder has been taken from the gun.

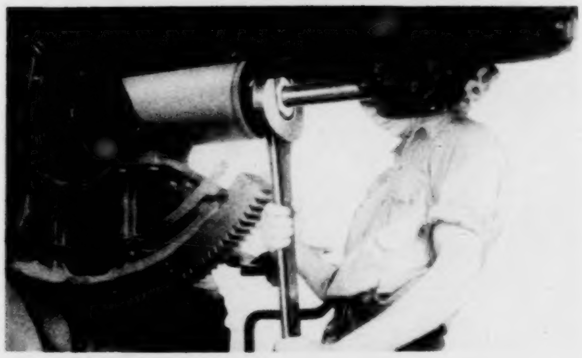


From now on, never get in line with the forward end of the cylinder. Just remember that it's holding compressed springs strong enough to resist many tons of recoil energy.

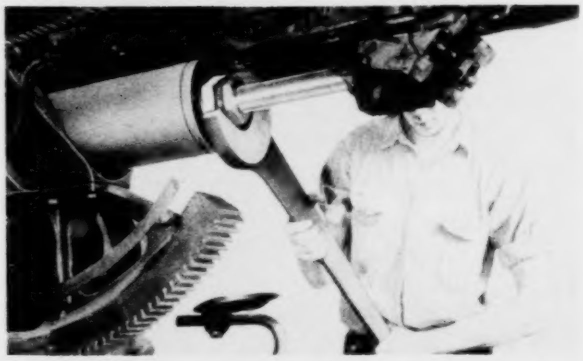




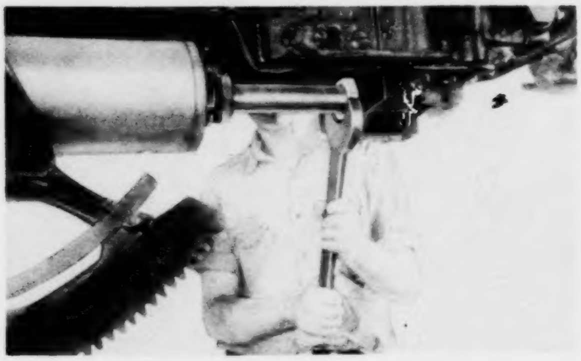
Now remove the securing screws at all cap square bolts. You can do this most conveniently with the gun elevated. Bring it back to zero when you're through.



Loosen the packing nut at the after cylinder head. This will permit the piston rod to slip through more easily a little later.

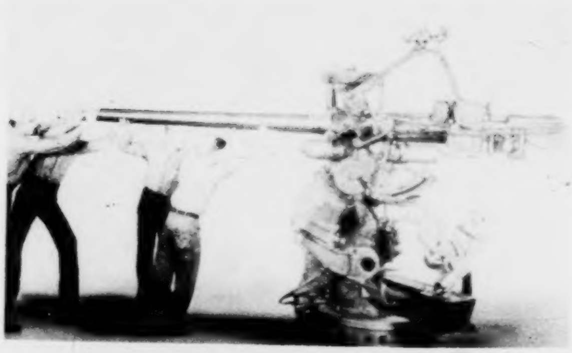


Start the threads on the after cylinder head by unscrewing the head a half turn but only if the head is to be removed later for replacement.

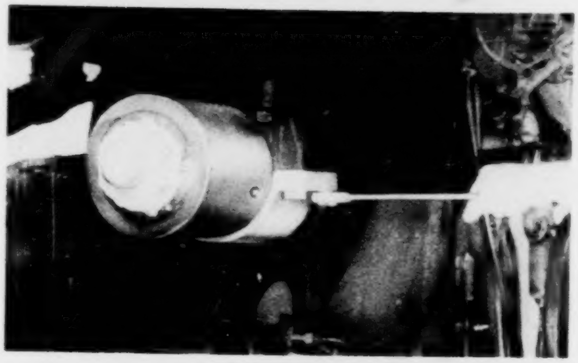


After taking out a keeper screw, the rod connecting nut can be unscrewed to disconnect the piston rod from the breech housing.

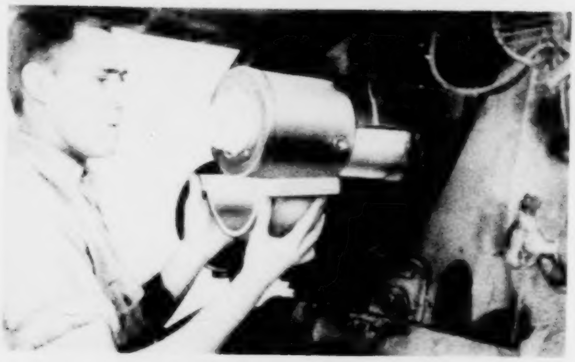
The gun is then pushed out of battery by hand, to run the breech housing clear of the piston rod. This should take up the little bit of slack you have left in the securing line. We can now disconnect the cylinder from the slide. To do this, . . .



. . . first remove the four bolts from the forward cap square,

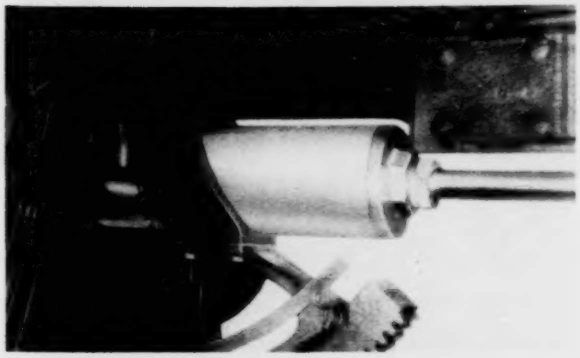


and take off the square.

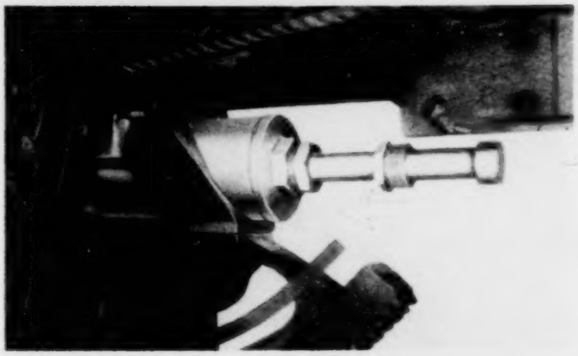


Remove the four bolts from the after cap square

and take off the square.



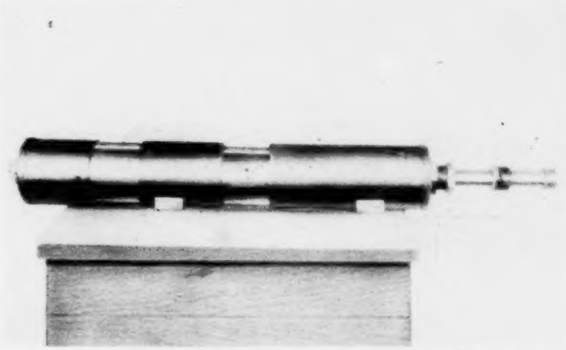
Lower the cylinder so that it rests on the lower part of the elevating arc bracket. It may be necessary to pound the cylinder down with a rawhide mall.



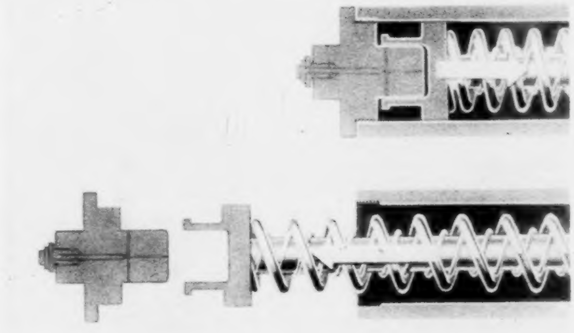
The cylinder is now moved forward in the bracket so that it can be removed from the forward end.

Four men will be needed at the forward end to remove the cylinder from the gun.

The removed cylinder is laid across a work bench or on the deck with chocks on each side to keep it from rolling. We're ready now to disassemble the systems this cylinder contains. But before we begin the actual work, let's see what we want to accomplish.

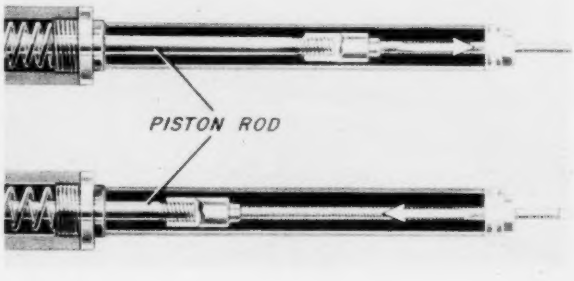


First, as shown in the upper view, we need a device which will draw back the piston against the spring pressure and which will hold the springs in compression so that they will not press against the forward cylinder head, which may then be removed with safety. After the head has been removed as shown below, the device should let the springs expand, relieving all compression and permitting their removal from the forward end.

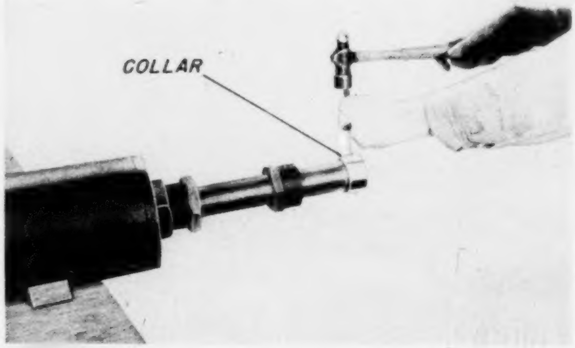


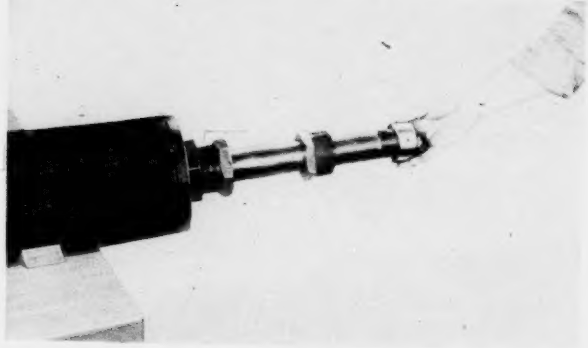
A spring compressor accomplishes the purposes of taking spring pressure off the forward cylinder head and later removing all compression from the springs. As shown above, it pulls the piston rod aft to compress the springs and permit removal of the cylinder head. Then, as shown below, it is screwed in, allowing the piston rod to move forward and to relieve compression on the springs so that they may be removed with safety. Now let's see how this spring compressor is attached.

SPRING COMPRESSOR

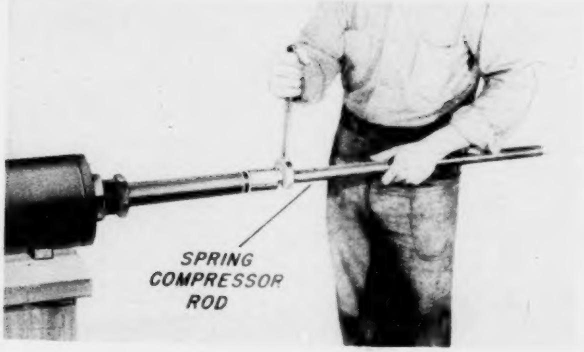


First, drive out a taper pin through the collar on the piston rod...

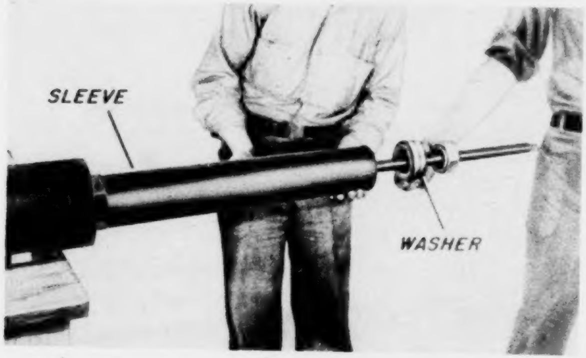




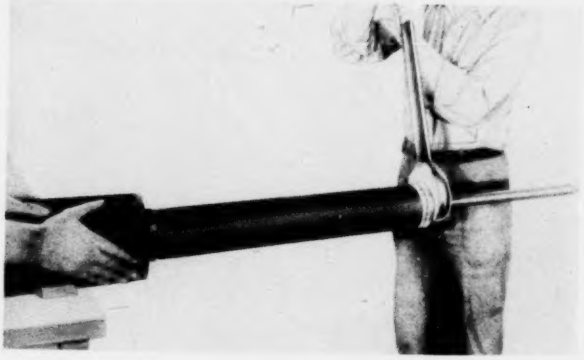
...so that the collar may be unscrewed. After this the connecting nut shown floating on the piston rod is slipped off.



A collar that is secured firmly to a threaded spring compressor rod is then screwed on the place of the regular collar. The compressor rod is now attached to the piston rod.

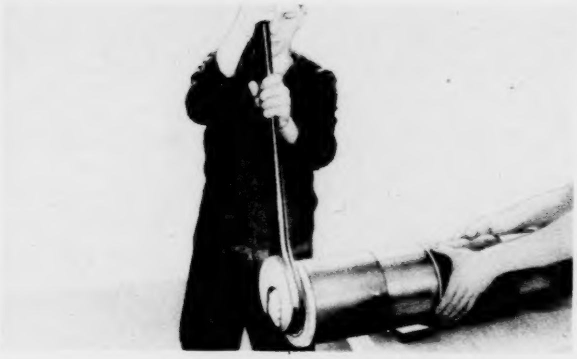


A spring compressor sleeve and a frictionless washer are slipped over the spring compressor rod, then a compressor nut is screwed onto the thread on the compressor rod.

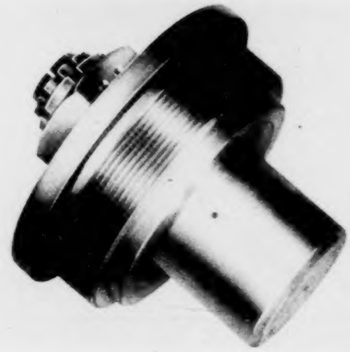


Screw the compressor nut down until the compressor rod is in tension showing that the spring pressure has been taken off the forward cylinder head.

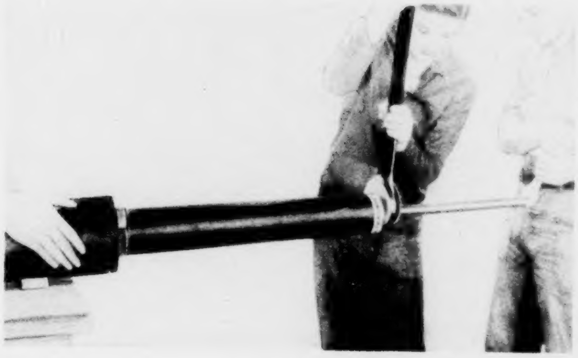
Unscrew the forward cylinder head, taking care of course to work from the side and to keep out of line with the forward end.



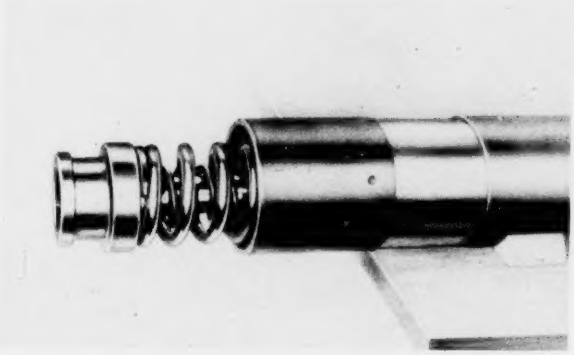
The removed cylinder head is inspected to see that the threads are in good shape and that the orifices are free of foreign matter. Be sure the setting of the needle valve is not disturbed.

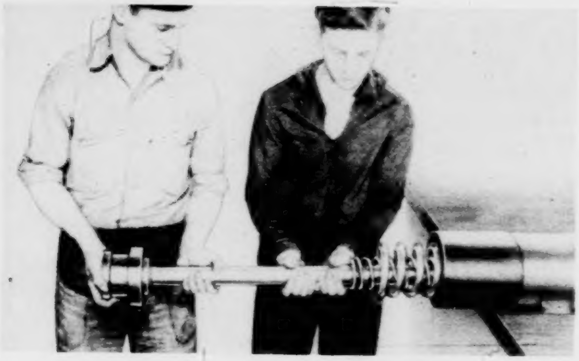


Now back off the compressor nut to relieve the tension of the recoil spring system. A second man must hold the squared end of the compressor rod with a wrench to prevent it from turning and unthreading from the piston rod. When spring tension has been entirely relieved, take off the spring compressor...

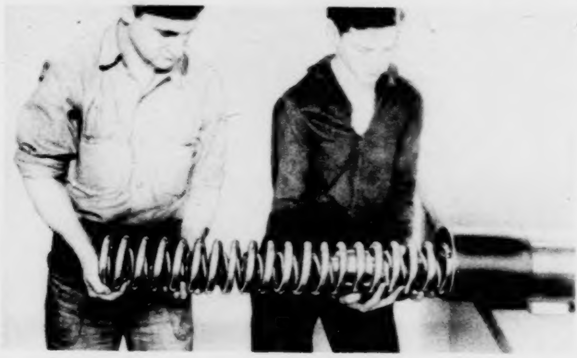


...and remove the parts inside the cylinder.

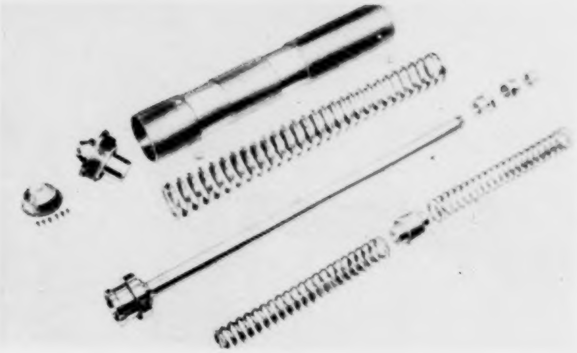




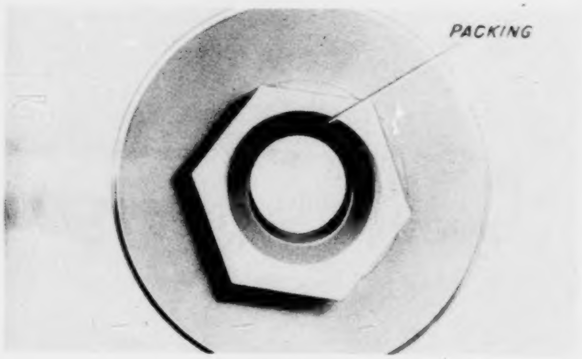
First, slide out the piston rod with piston attached,



then the entire spring system–including outer springs, both inner springs and the inner spring separator.

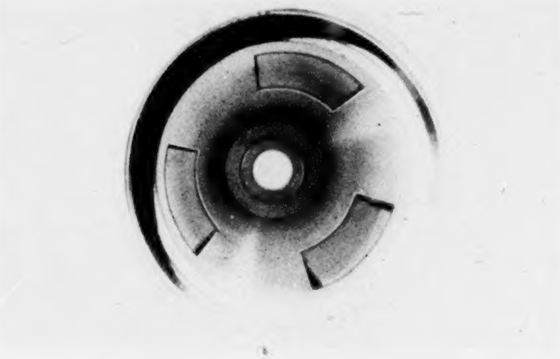


All the disassembled parts must now be carefully inspected and thoroughly cleaned. Make a very careful inspection of the springs and replace any that show breaks, excessive wear or other damage.

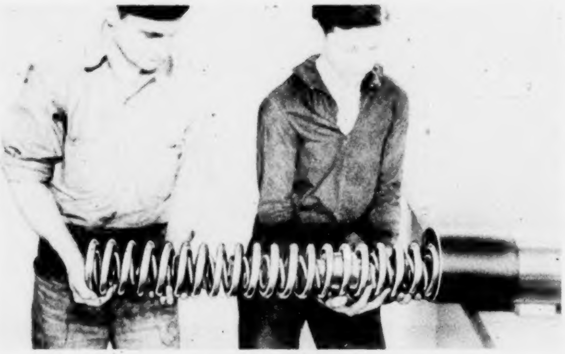


The piston rod packing at the after end of the cylinder should be checked during disassembly, usually this packing is replaced while the cylinder is on the gun whenever leaks makes replacement necessary.

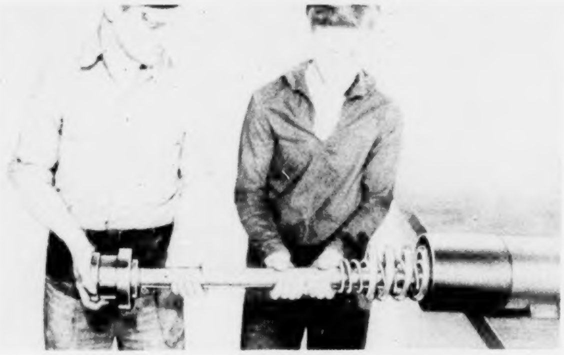
The throttling groove should be inspected through the forward end of the cylinder before reassembly operations begin. Remove all foreign matter such as chips and gummy deposits. After this, begin reassembling.



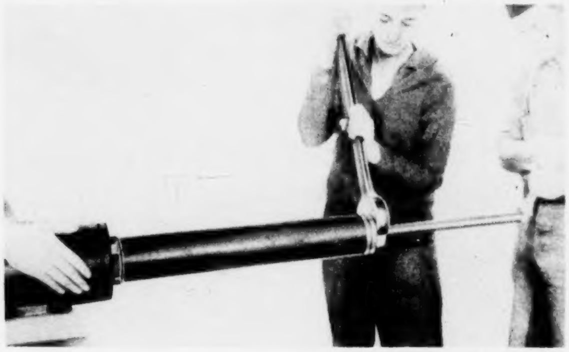
Installing the springs in the cylinder is the first step in reassembling.

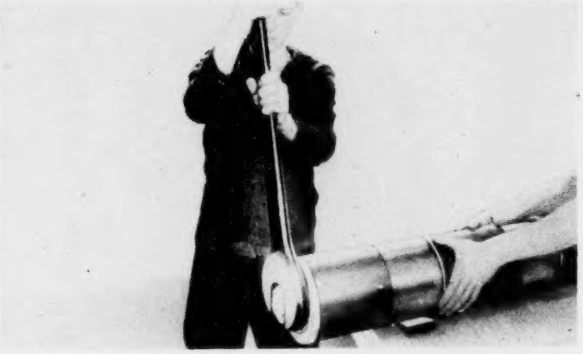


Then the piston rod is slid in through the separator and through the packing in the after cylinder head. If you turn the threaded end of the piston rod carefully through the packing, this packing may still be in good condition when the reassembled system is tested.

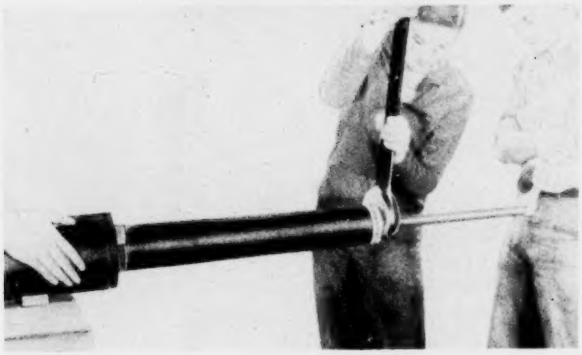


Now, install the spring compressor again and compress the recoil springs enough to allow...

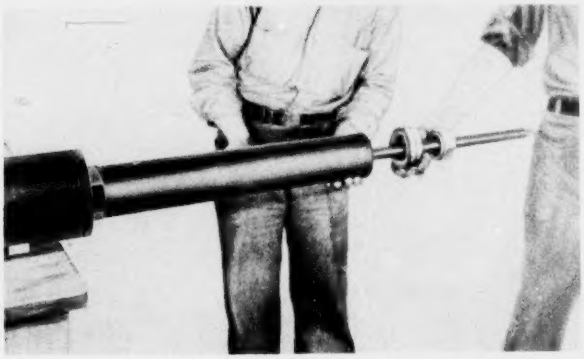




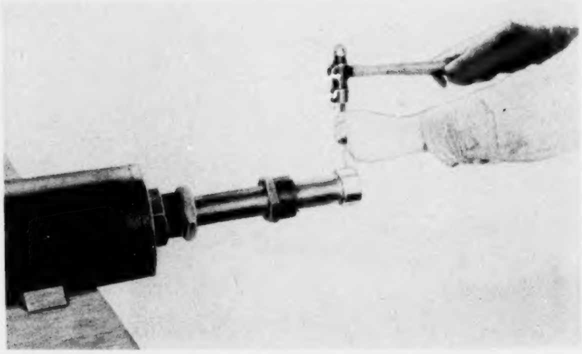
. . . the forward cylinder head to be screwed in as tightly as possible. After this,



back off the compressor nut until the tension of the recoil springs is held by the forward cylinder head. Now we're all set . . .

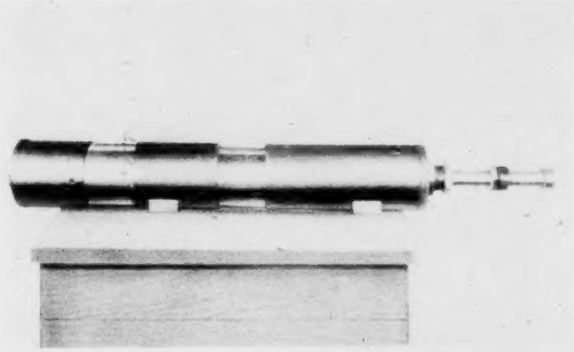


. . . to remove the spring compressor.



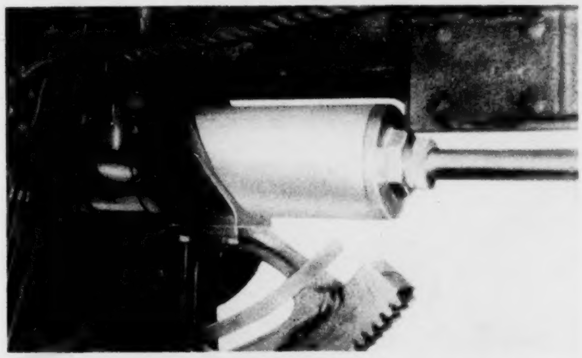
The collar, is screwed on the piston rod and is secured with a taper pin after the connecting nut has been slipped over the piston rod.

Now the entire cylinder assembly is ready to be installed on the gun.

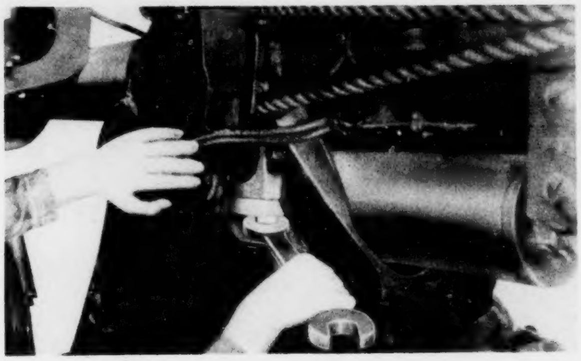


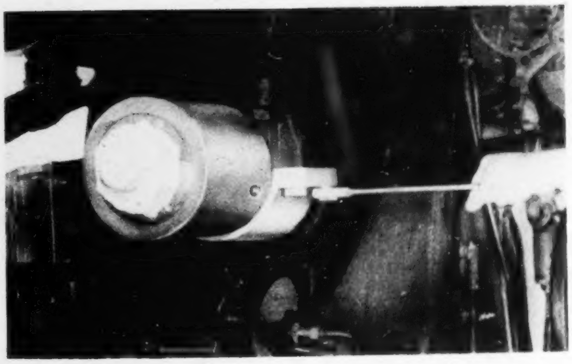
Four men lift it to the gun and work it back in the elevating arc bracket.

Then it is slipped back in the bracket to permit replacement of the cap squares.

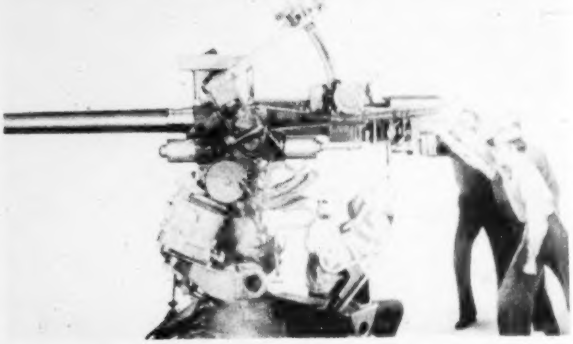


The after cap square is drawn up by screwing in the four bolts.

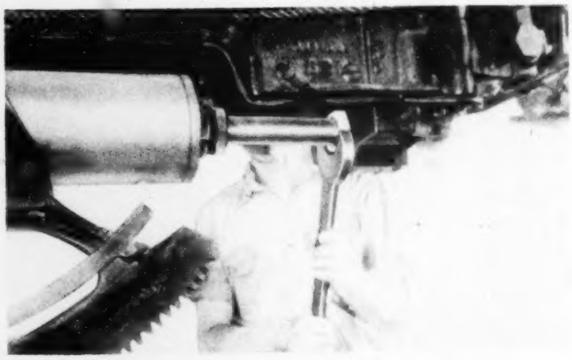




Then the forward cap square is bolted on in the same way.



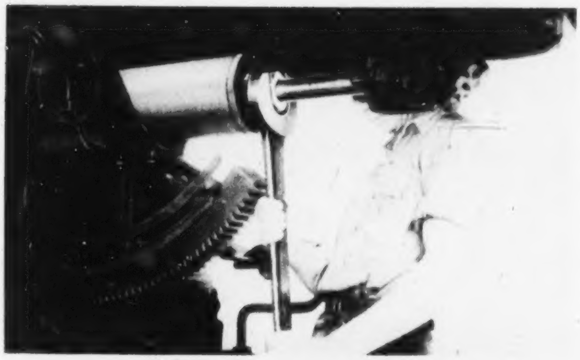
Push the gun back in battery by hand. A block of wood held between the piston rod collar and its hole in the breech housing prevents damage if the collar is not lined up properly. Then remove the block and push the gun in battery, a little at a time, until you are sure the line-up is all right and that the collar will run into the hole.



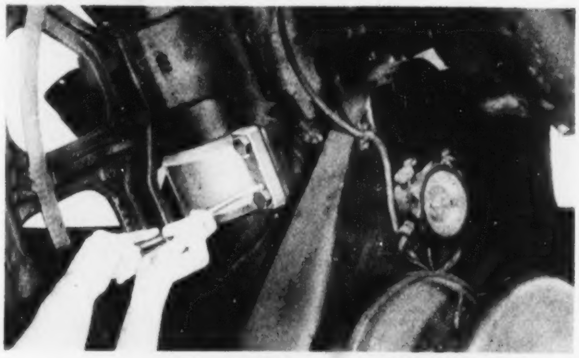
Secure the piston rod to the breech housing by drawing up the piston rod connecting nut. Don't forget the keeper screw. After this the securing line may be removed as the breech housing and barrel are now held by the piston rod.

If the after cylinder head has been removed and replaced during disassembly, it is now tightened.

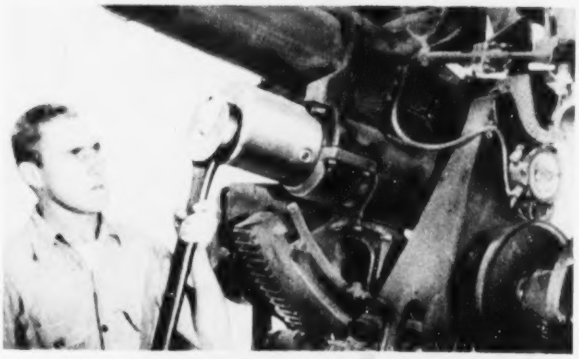
Tighten the packing nut. You'll have to retighten this nut later and replace the packing if any leaks develop when the systems are tested after reassembly.



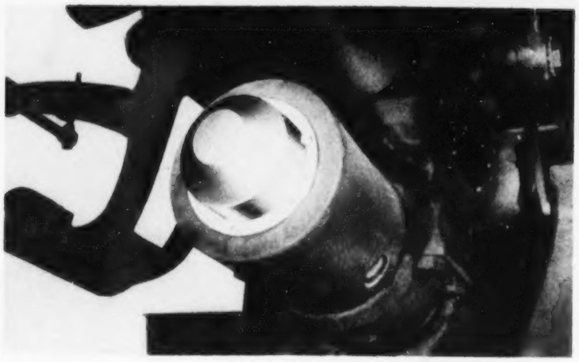
Now replace the securing screw that holds the cap square bolts in place after elevating the gun for convenience.



Tighten the forward cylinder head firmly, then cover the head with special sealing compound...

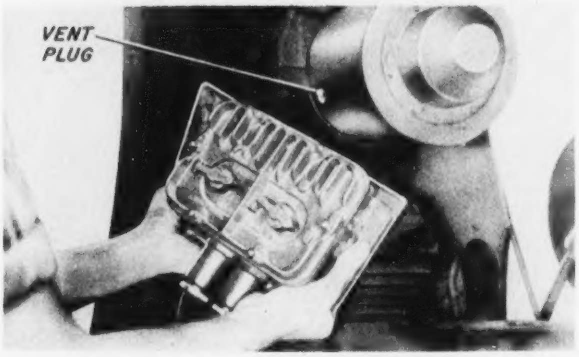


...and replace the needle valve cover by screwing in the six securing bolts.

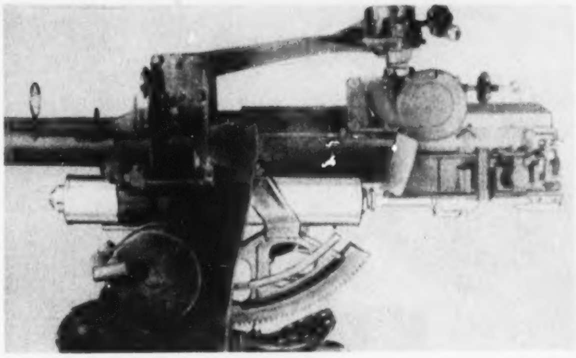


The after drain plug is then screwed in, to prepare the cylinder for refilling with recoil liquid.

Before refilling the cylinder elevate the gun to 85 degrees. Pour the liquid slowly into the filler hole through a funnel equipped with a 200 wire mesh filler and replace any that may have been lost or spilled. Then close the filler hole and depress the gun to fill the dash pot. Elevate and add more liquid. Be sure that all liquid is passed through the filter. The cylinder is properly filled when the liquid is up to the lower part of the filler hole.



Now screw the vent plug back into its hole on the right side of the cylinder. While you're on this side of the gun, reinstall the lighting switch panel on its bracket.

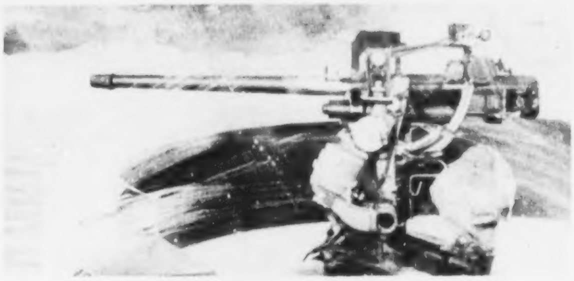


Everything is now back together again and the recoil and counterrecoil systems are ready for use. All you need to do is stop any leaks by tightening the packing nut and possibly replacing the piston rod packing.

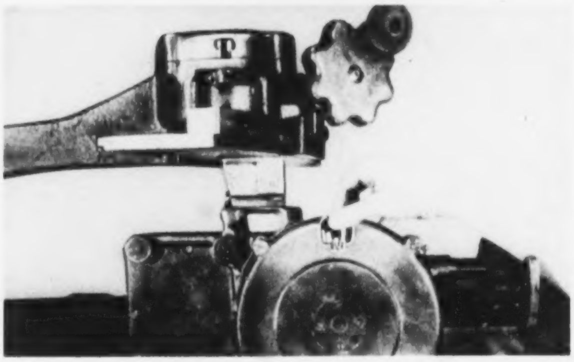
The recoil and counterrecoil actions of the 3''/50 can mean the difference between a gun that is firing in action and one that isn't. Keep the recoil and counterrecoil systems in good repair and properly filled with recoil liquid so they will be ready for action at all times.

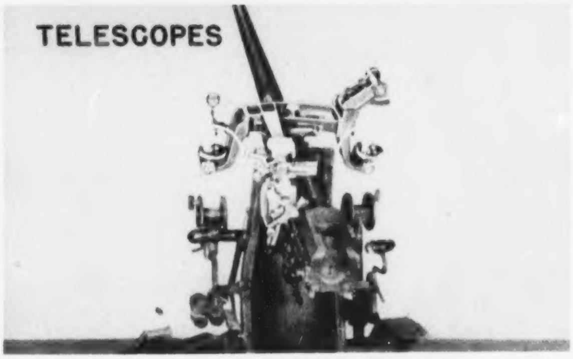
DISASSEMBLY AND REASSEMBLY OF THE SIGHT

The sight of the 3''/50 is constantly exposed to the weather. Rain and seawater may find their way into the gear brackets or cause corrosion and binding in other parts of the mechanism. When binding can be removed in no other way the sight mechanism must be disassembled and overhauled. Some maintenance jobs may be done without disassembling the entire mechanism. For example...

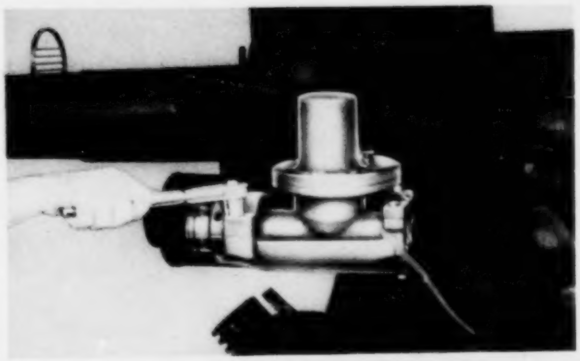


...the drums of the sight angle and deflection angle indicators are readjusted on the gun.

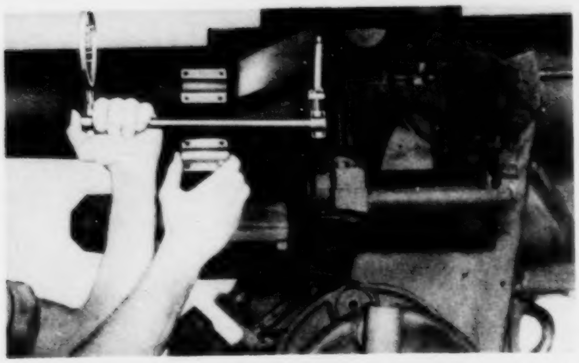




Telescopes are inspected on the gun. If they require repair or adjustment send them to a tender. When the sight mechanism is to be entirely disassembled the telescopes must be removed from their holders.

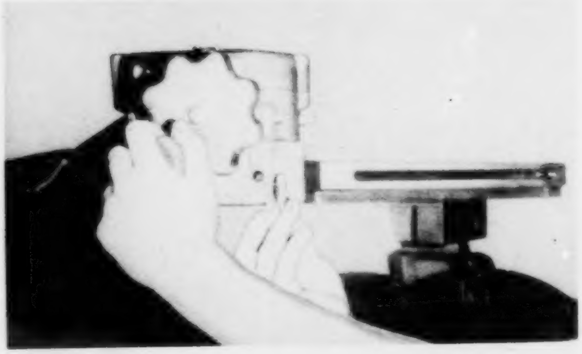


The pointer's telescope is freed from its holder by unbolting the cap square at its forward end and loosening the adjusting bolts at the after end. The trainer's telescope is taken out in the same way. Upon removal the telescopes are sent to a tender or stowed until the sight mechanism is reassembled.



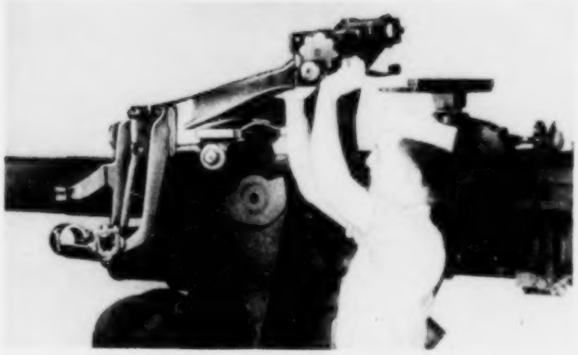
The pointer's open sight is removed from the gun, after its cap square has been unbolted. This is done to prevent the sight from striking the barrel when the sight yoke is being taken off. It is not necessary to remove the trainer's open sight.

The counterweight is removed after it had been unbolted from the slide.

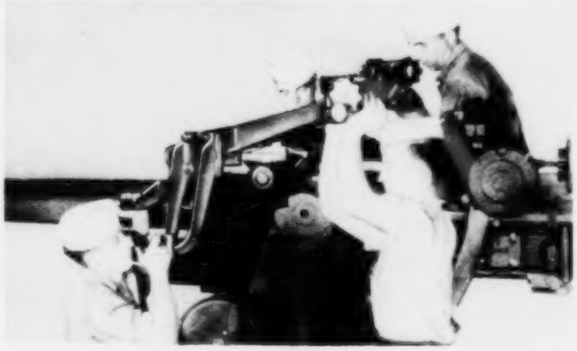


Back the after end of the sight yoke arm to the left, off the deflection bar, after removing the stop set screw. Then swing the arm outboard to clear the bar...

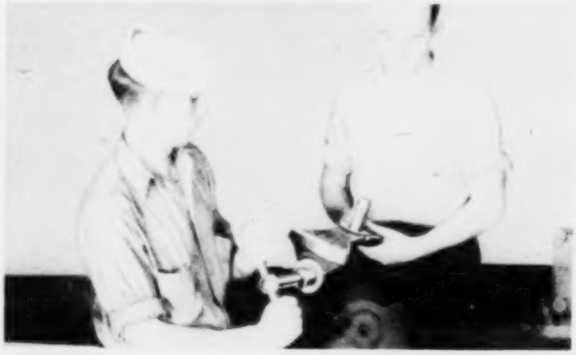
...and continue swinging it outboard until the yoke is disengaged from the key arcs in the elevating gear rocker.



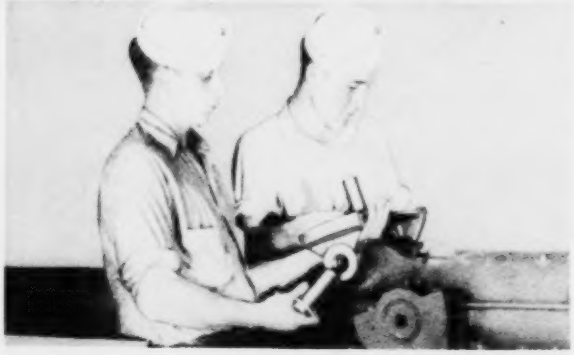
Then lift the sight yoke from the azimuth pivot pin and set it aside.

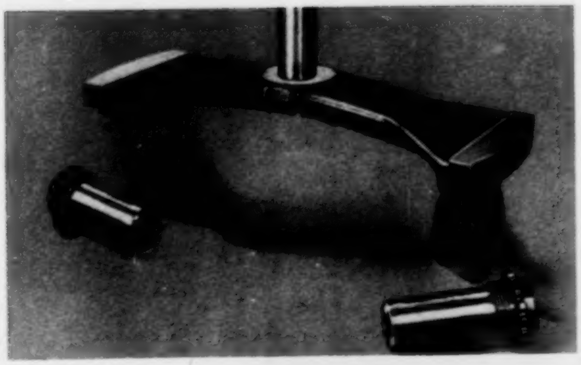


Unscrew the rocker pivot pin at each side of the elevating gear rocker...

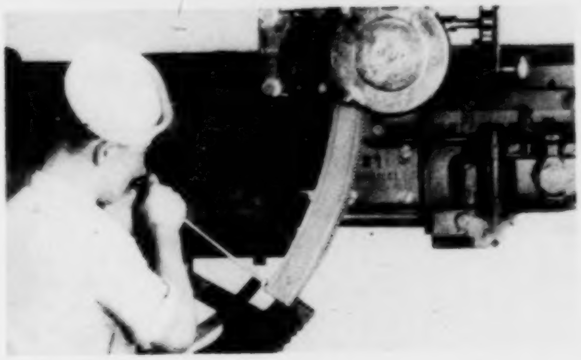


...remove the pins and lift off the rocker.

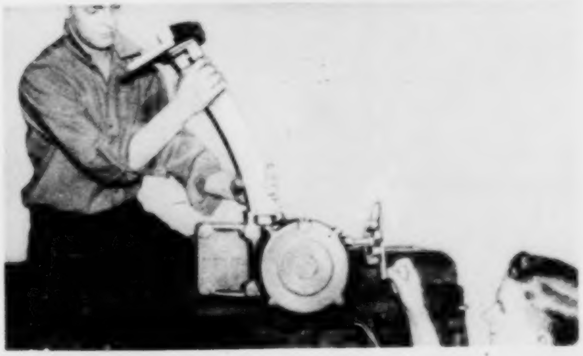




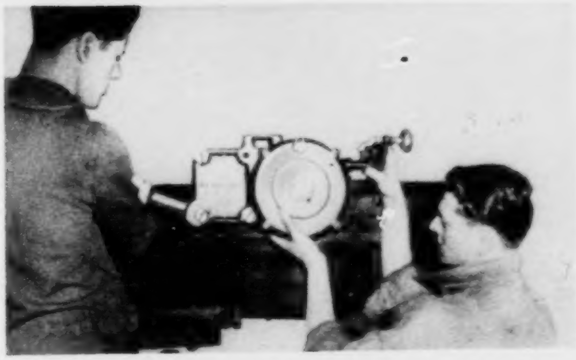
The rocker and pivot pins must be inspected carefully at all bearing points to make sure there are no burrs, gummy deposits or corroded areas to cause binding.



Now unscrew the lower stop from the sight angle bar.



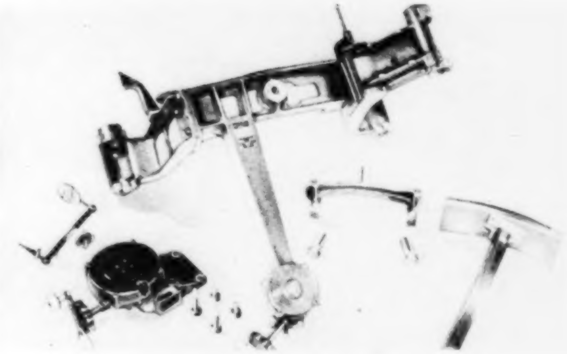
Crank the bar through the elevating gear bracket with the sight angle handwheel, lift it out and set it aside. The bracket...



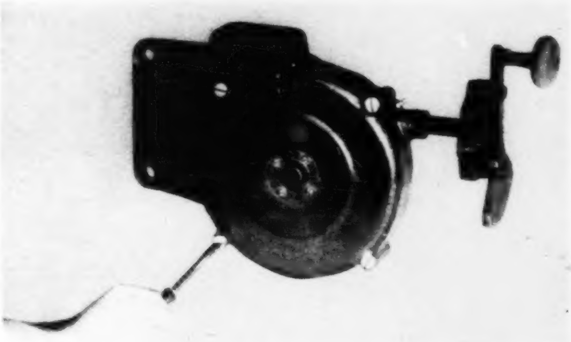
...is then unbolted and removed.

The gun is now entirely stripped of all parts of the sight. Before the reassembly of the mechanism is begun, a number of important jobs must be done.

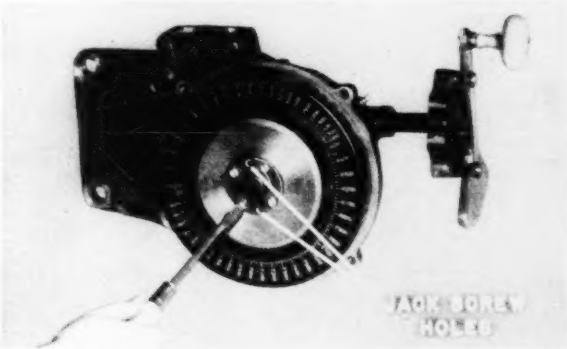
All the disassembled parts must be carefully inspected to make sure there are no burrs on bearing or gear surfaces and that all foreign matter and corrosion are removed by careful cleaning. Special maintenance procedures are necessary with the sight angle and deflection indicators.

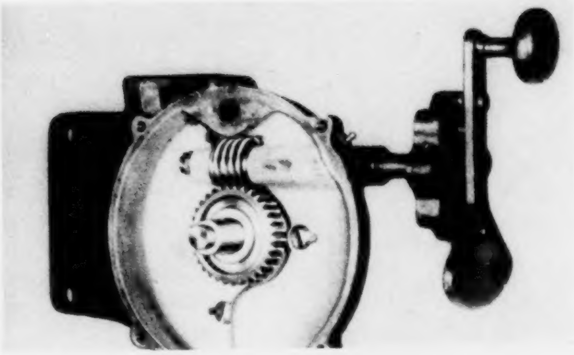


The sight angle indicator cover is removed after unscrewing four mounting screws. This exposes...

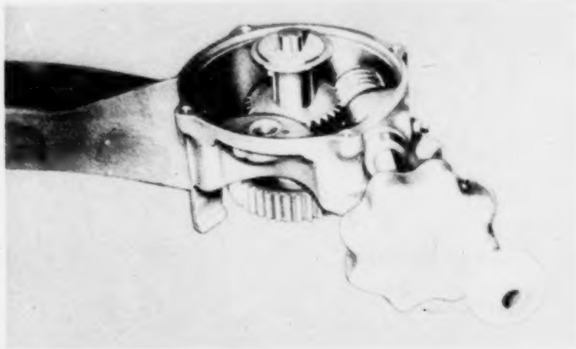


...the sight angle drum. Remove the four retaining screws–then using two of these in the jack screw holes, tighten both alternately until the clamp, clamp disc and drum are loose enough to be removed. Close the drum thoroughly.





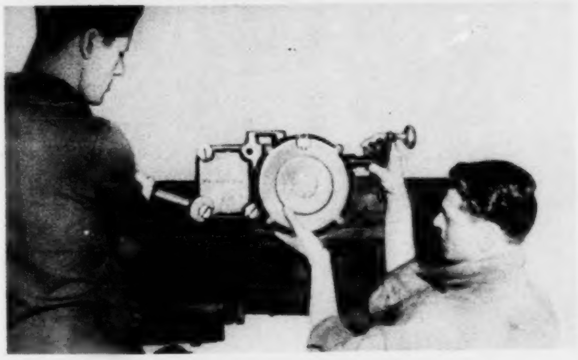
Also clean and inspect the worm, worm wheel and pinion. After this, lubricate the gears and install the sight angle drum and indicator cover.



The deflection indicator is cleaned, inspected and lubricated in the same way. We are now ready to begin reassembly.

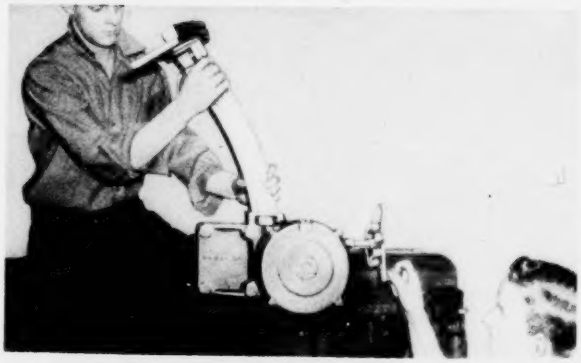
REASSEMBLY

REASSEMBLY: (Title Frame)

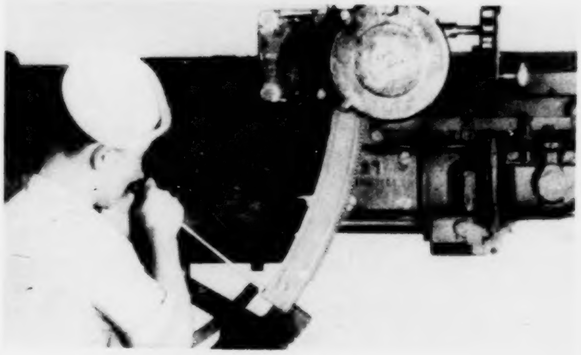


Bolting the elevating gear bracket in place is the first step in reassembly. Into the gear bracket...

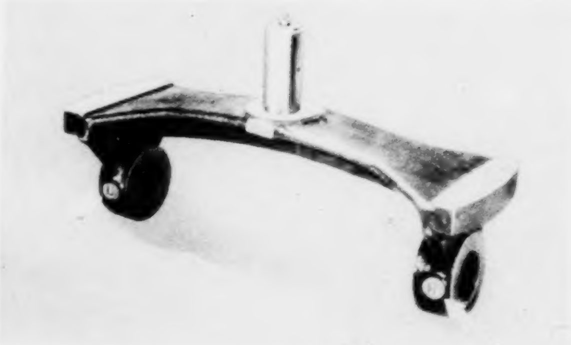
...insert the sight angle bar and turn the sight angle handwheel to crank the bar down in the bracket.



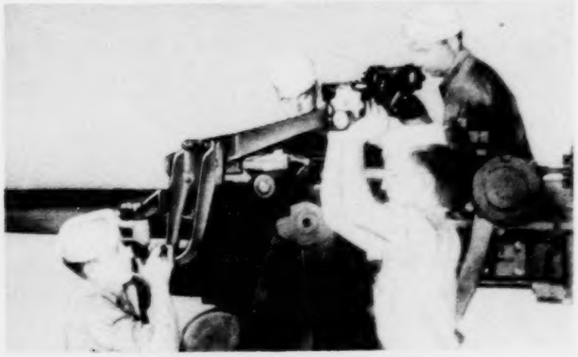
Then screw the lower stop into the sight angle bar. After this move forward, to install...



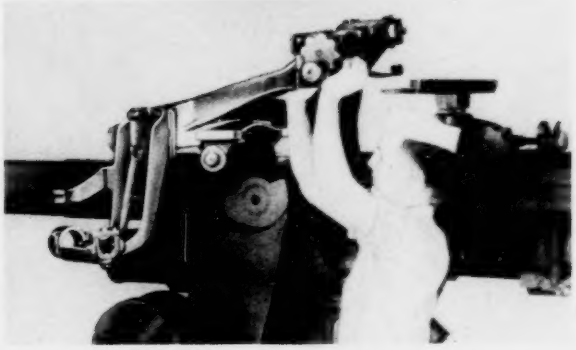
...the elevating gear rocker. See that the side marked "L" is on the left side of the slide, as you look forward, and the side marked "R" on the right.



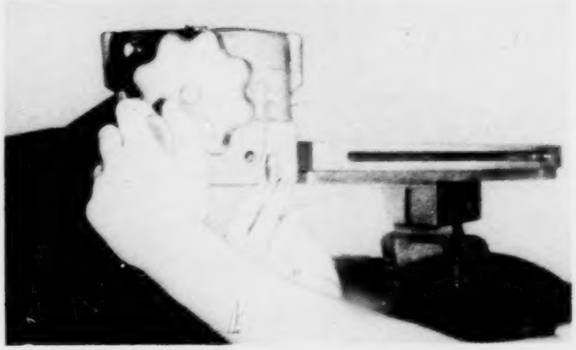
Mount the rocker on the slide.



Install the sight yoke on the rocker . . .



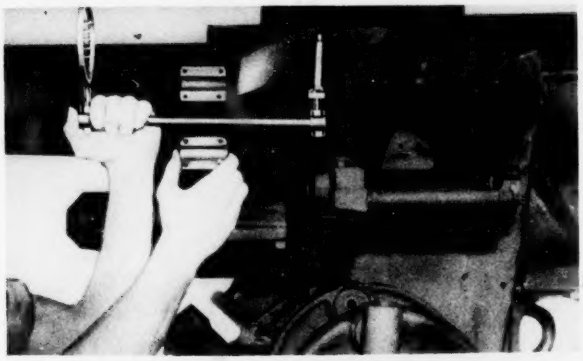
. . . and swing the sight yoke arm inboard to engage the yoke keyways with the rocker key arcs.



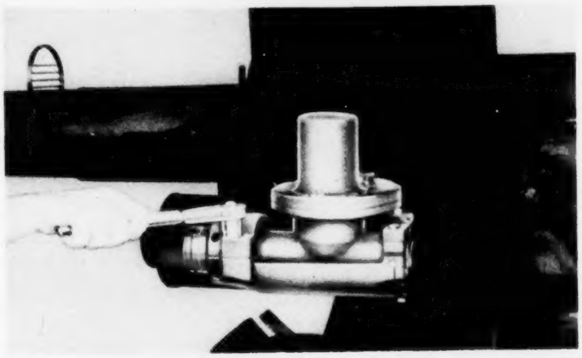
Continue swinging the yoke arm inboard until the keyway on the deflection gear bracket engages the deflection bar and the pinion meshes with the rack. Then screw in the stop set screw.

The counterweight is lowered into place and secured with its four bolts.

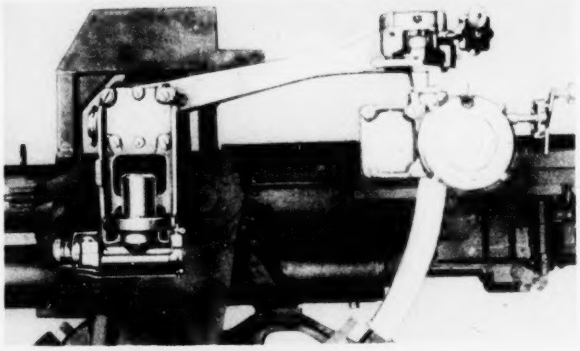
Mount the pointer's open sight. . .



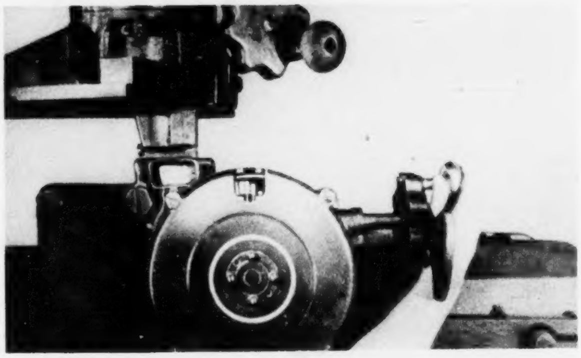
. . . and install the pointer's and trainer's telescopes in their holders by bolting down the cap squares at the forward ends. When this has been done. . .

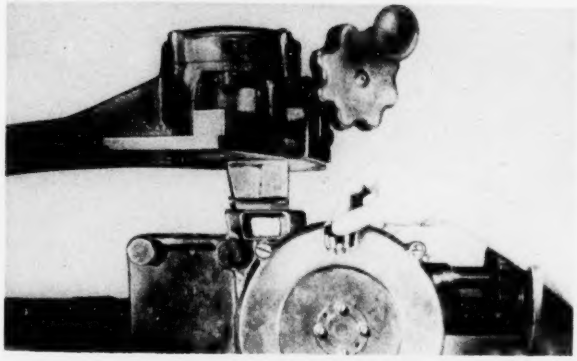


. . . the sights are completely reassembled. We must now adjust the sight angle and deflection indicators. To adjust the sight angle indicator. . .

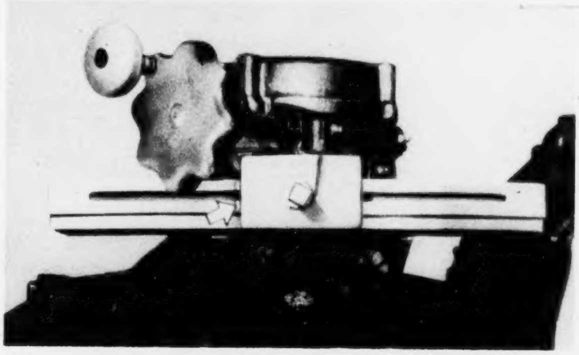


. . . turn the sight angle handwheel until the sight bar indicates zero sight angle and zero range. If these same values do not show at the openings on the sight angle indicator, loosen the four screws at the center of the indicator, . . .

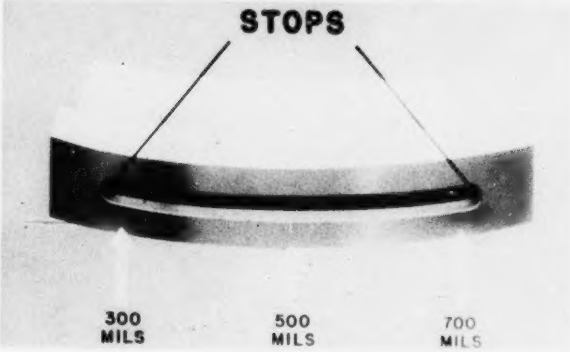




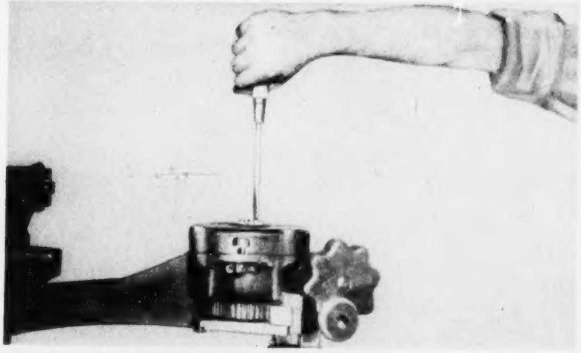
...slip the drum around by hand until it indicates zero, and tighten the screws again. To adjust the deflection indicator, the deflection handwheel is turned...



...until the left edge of the deflection gear bracket lines up with a scribe mark on the after face of the deflection bar. Then set the deflection indicator drum at 500 mils, which means zero deflection angle. If there is no scribe mark, one must be established by adjusting the drum with relation to the deflection bar.

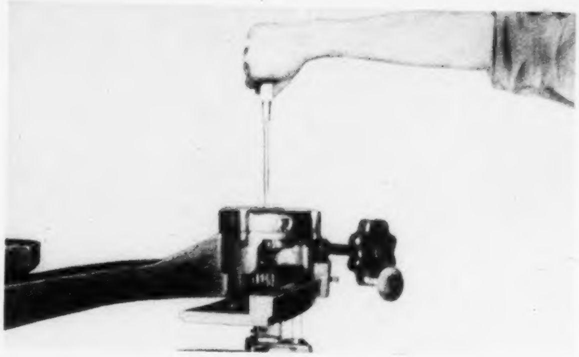


The stops allow the indicator drum to register a little less than 300 mils on the extreme left setting and a little over 700 on the extreme right. When the indicator is run out to the stops, the drum should register equal amounts under 300 and over 700. After the drum has been accurately adjusted to the stops in this manner, the scribe mark for the 500 mil setting is made. To adjust the drum to the stops, crank the indicator all the way to the left...

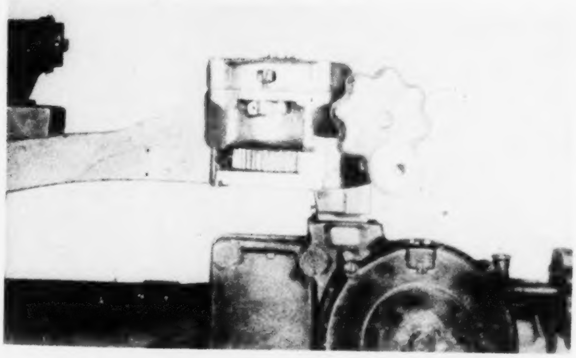


...and loosen the four screws at the center of the indicator. Set the deflection drum at 300 mils and tighten the screws. Then crank the gear bracket to the right until the stops strike...

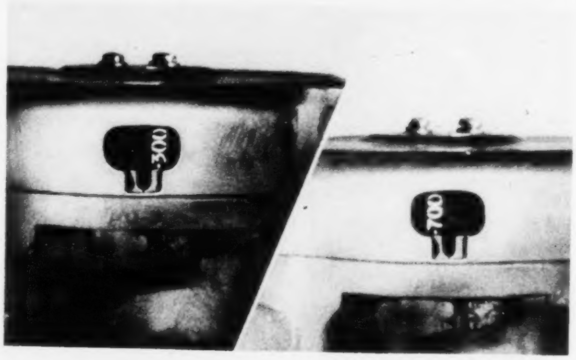
...and again loosen the four screws. At this time the indicator will read something over 700 mils. Slip the drum by hand half way back to 700 and again tighten the screws.



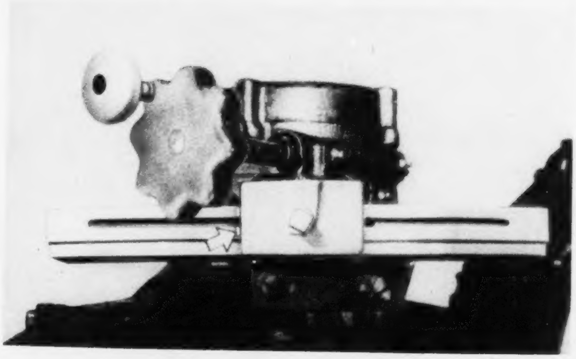
With the indicator cranked once more to the extreme left, it should read the same number of mils less than 300 that the right hand reading was over 700.

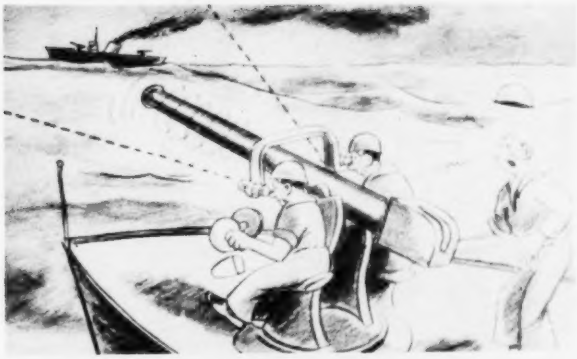


These closeup views show how a correctly adjusted deflection angle indicator should read at its extreme left and extreme right settings. At the left it must show a little less than 300, at the right an equal amount over 700. Some 3''/50 sights provide deflections from 200 to 800 mils, but the same principle is used in adjusting them, since 500 mils is zero deflection in both types.



With the deflection angle indicator reading 500 mils, make a permanent scribe mark on the after face of the deflection bar along the left edge of the deflection gear bracket, for further reference. We know now that the deflection angle and sight angle indicators are correctly adjusted. But, even so...

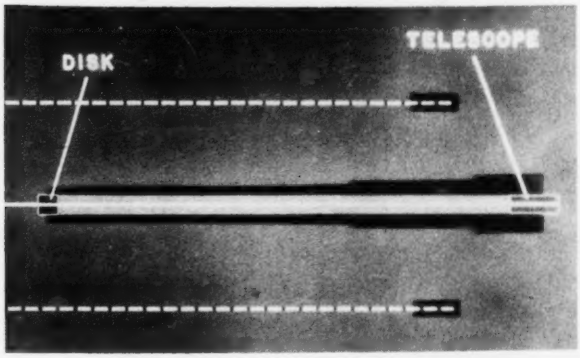




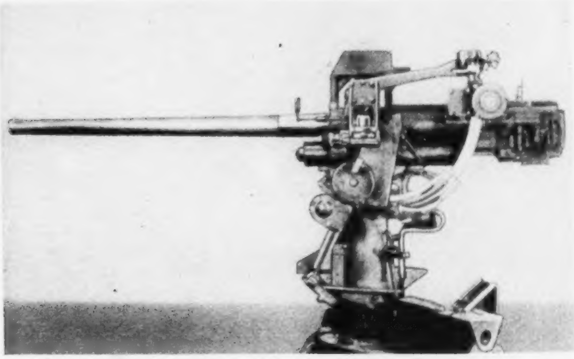
...the pointer and trainer could still have a tough time getting together on the target–and the gun could be aimed at something else. The only way to correct a situation like this is to line up the telescopes with the axis of the gun bore. This is done...

BORE-
SIGHTING

...by boresighting. The gun must always be boresighted after the sight mechanism has been overhauled. The first step in boresighting...

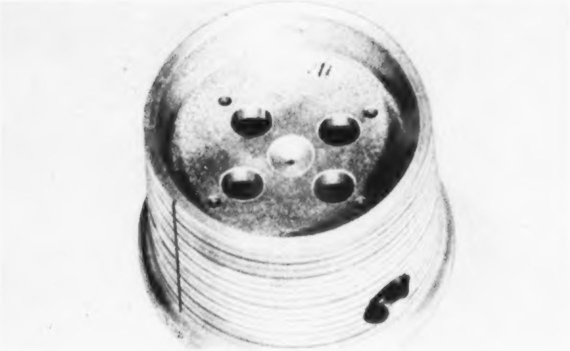


...is to install a disc at the muzzle and telescope at the breech, thus establishing a line of sight through the axis of the gun bore. This line of sight is brought to bear on a target at 5000 yards range. Then the pointer's and trainer's lines of sight are adjusted to bear on this same target, thus boresighting the gun.

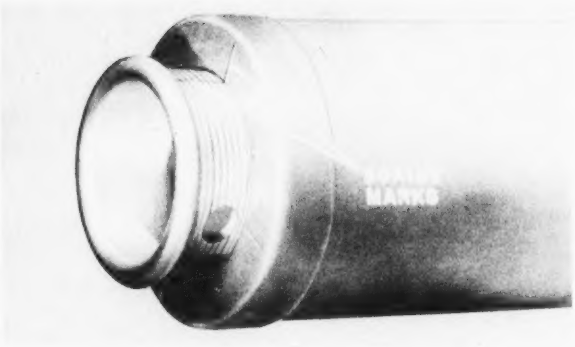


Before boresighting set the gun at zero elevation–with zero sight angle and zero deflection angle. We're ready now to install the muzzle disc.

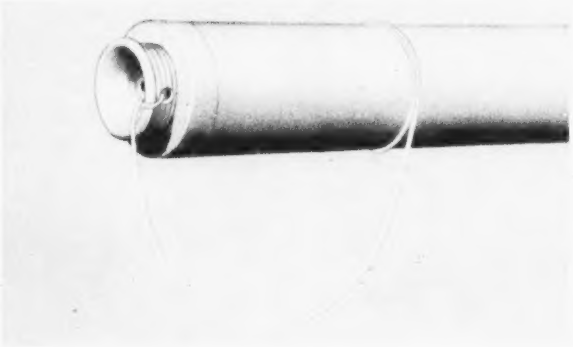
The muzzle disc locates the center of the bore at the forward end of the gun. This bore center is represented by the small hole in the center of the disc. The four other small holes are used to bring the telescope crosswire to the vertical and horizontal positions. The four large holes serve to admit light into the barrel. When the muzzle disc is set in place...



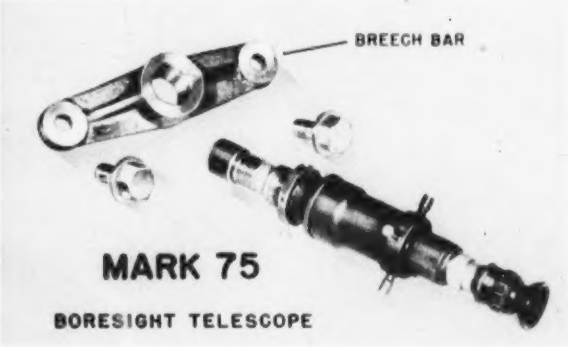
...a scribe mark on the top of the muzzle face and a scribe mark on the disc must be lined up. Make sure also that the concentric rings around the disc are parallel to the muzzle face.

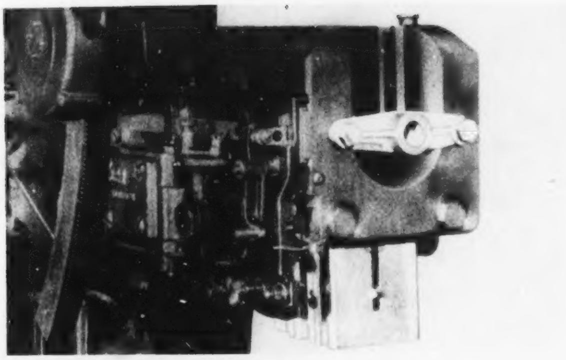


Then secure the disc to the barrel with a safety lanyard. This will prevent it from being lost or damaged if it should fall out of the muzzle. Now let's go to the after end of the gun.

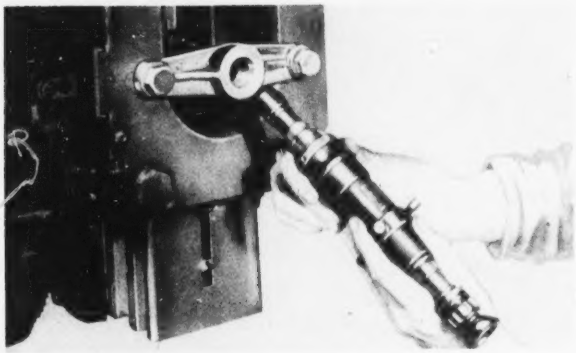


A breech bar is used to mount a Mark 75 boresight telescope exactly on the axis of the gun bore. This breech bar is secured by its two bolts. . .

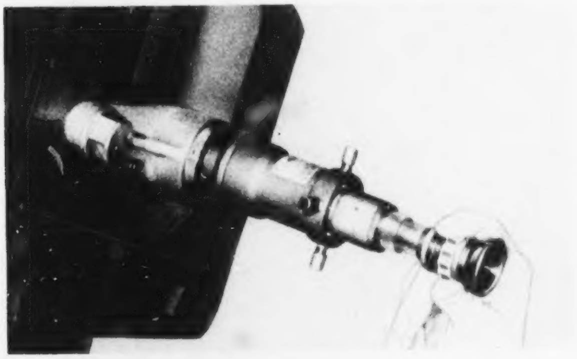




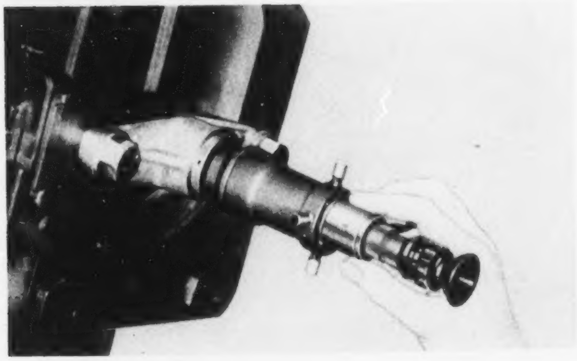
. . .to the after face of the breech housing. The block is then lowered.



The boresight telescope is shipped to provide a means of sighting, through the muzzle disc, along the axis of the gun bore. Now elevate the gun so that the boresight telescope will be pointed to the sky, providing a clear field of view, without distracting lines.

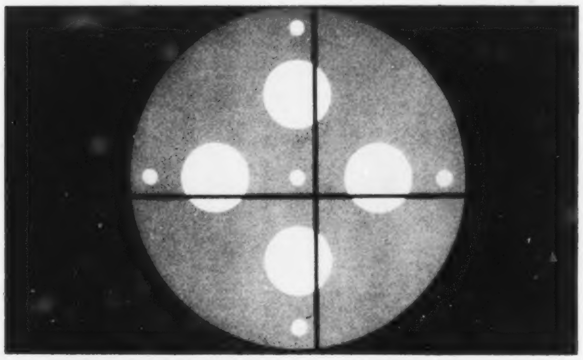


Bring the crosswires of the telescope into focus by turning the narrow focusing band.

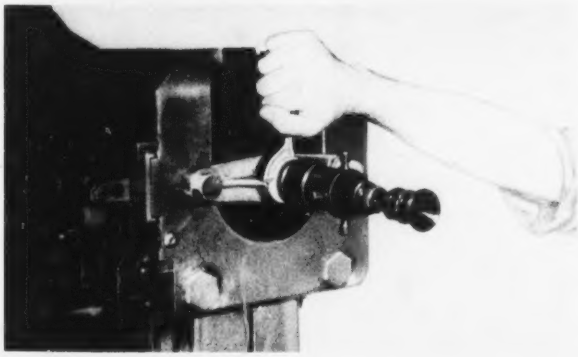


Then turn the wide focusing band to bring the central peephole of the muzzle disc into sharp focus. After this, reset the gun to zero elevation.

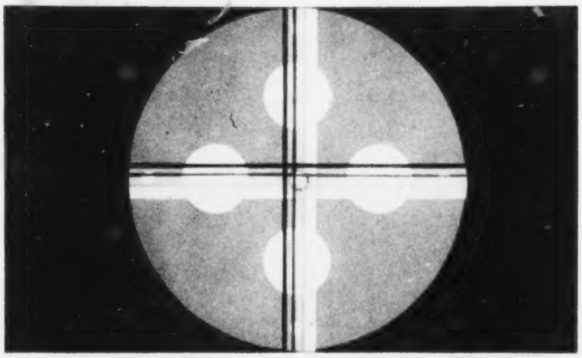
Adjust the crosswires to the horizontal and vertical position by turning the entire telescope in the breech bar.



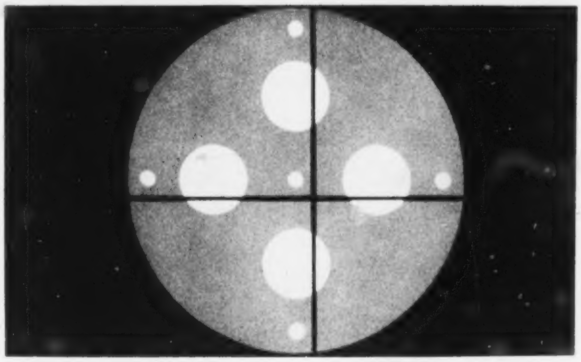
Then lock the telescope in position with its locking band.

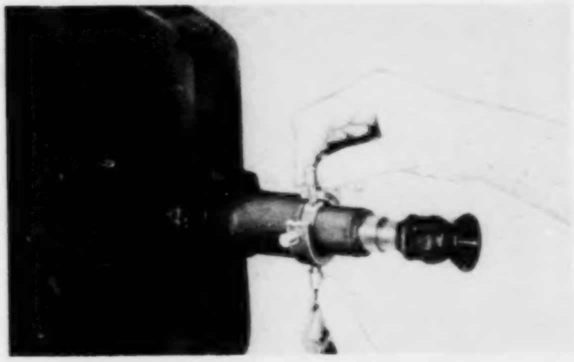


After this, check for parallax by moving your eye back and forth, and up and down, over the eyepiece, to see if the intersection of the crosswire appears to move with relation to the central peephole of the muzzle disc. If this occurs, remove parallax by careful refocusing with the wide focusing band, until the intersection of the crosswires remains stationary as you move your eye around the eyepiece. This may be a tedious job, but it must be done painstakingly to assure accurate results.

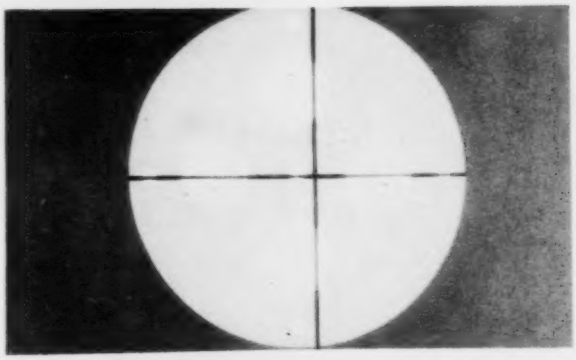


If the horizontal crosswire is above or below the central peephole, . . .

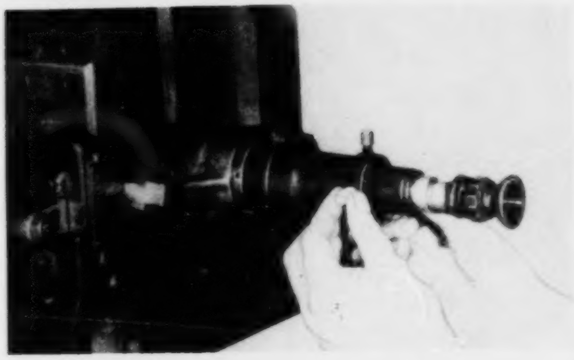




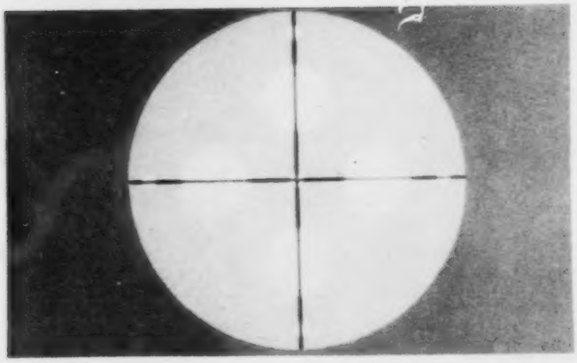
. . .adjustment is made with the vertical adjusting screws on the telescope. Each of these screws rests in a shoe, which in turn bears against the telescope tube. Since this tube is made of soft brass, set up these screws lightly; otherwise, you may score the bearing surface. Loosen one of these screws and tighten the other until. . .



. . .the horizontal crosswire centers on the peephole. Then, if the vertical crosswire is to the left or right of the central peephole,. . .

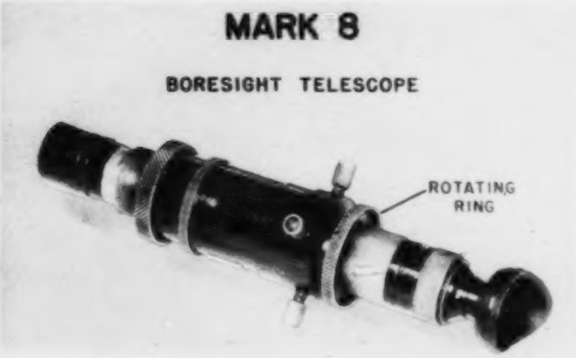


. . .loosen one of the horizontal adjusting screws, and tighten the other until. . .

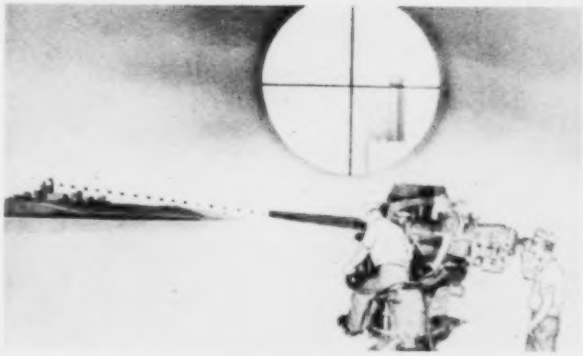


. . .the vertical, as well as the horizontal crosswire, is now properly centered on the muzzle disc. This means that a line of sight through the telescope is exactly on the axis of the gun bore.

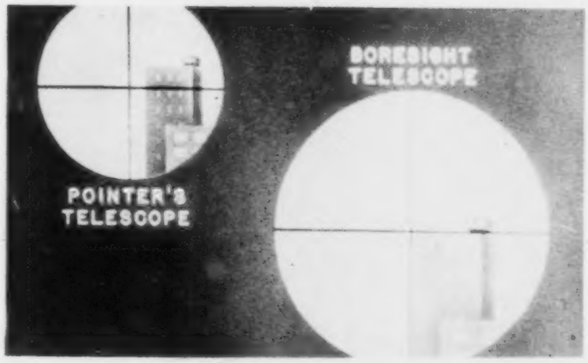
The Mark 8 boresight telescope, sometimes used in boresighting the 3"/50, has a rotating ring used to turn the telescope through 360 degrees. When the telescope is turned, the intersection of the crosswires should still be at the center of the muzzle disc. If it is not, the telescope is improperly collimated and another should be used. When the crosswires intersect at the center of the muzzle disc, remove the disc. At this time also, make certain that the sight angle and deflection settings are still zero.



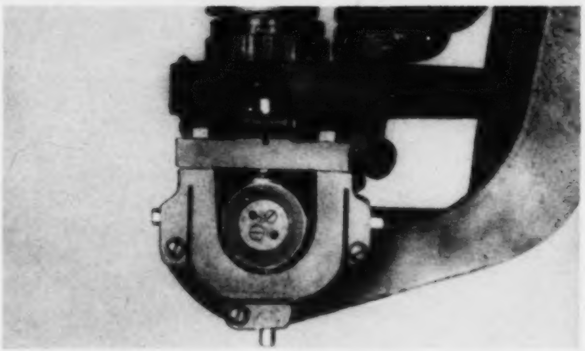
Focus on a target with a range of about 5000 yards. When boresighting is done in port, as in this case, select a target like the building shown in the inset which has definite vertical and horizontal lines. The boresighter must coach the pointer and trainer to elevate and train the gun so as to bring his horizontal and vertical crosswires on distinct horizontal and vertical lines of the target. The pointer and trainer then view the target through the boresight telescope, to identify the horizontal and vertical lines.

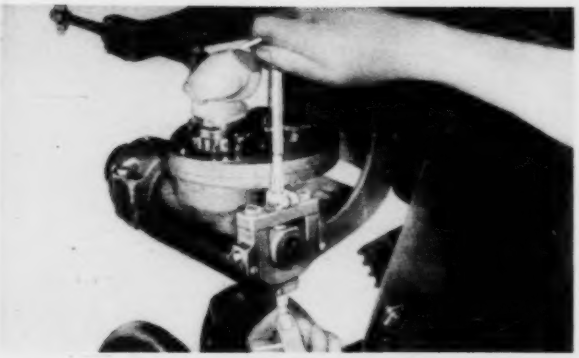


The pointer's telescope is first checked, on the same target, against the boresight telescope. If there is some motion of the ship, the boresighter must "mark" when his horizontal crosswire is on. If the pointer's telescope is not in alignment, the horizontal crosswire will not be on the target at the same instant the boresighter "marks." In this case the pointer's telescope must be adjusted.

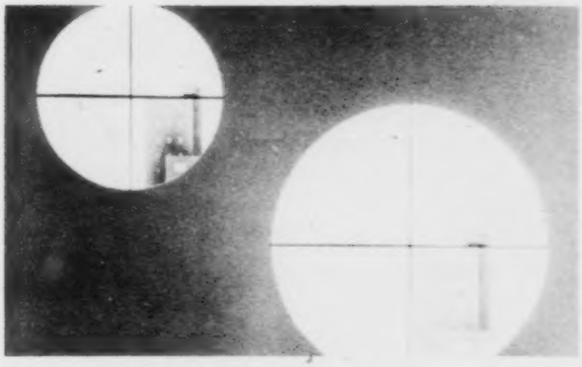


The adjustments for the pointer's telescope are located at the after end of the telescope holder. The telescope is moved in one direction at a time by backing off one adjusting screw, while tightening the opposite adjusting screw.

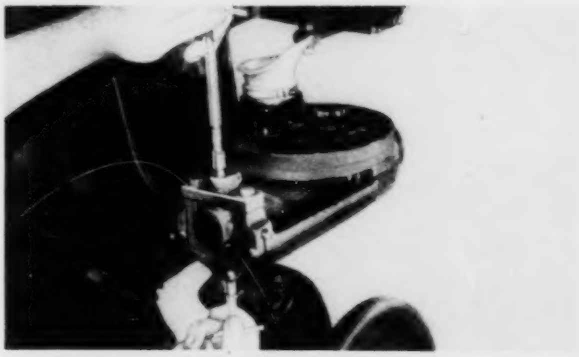




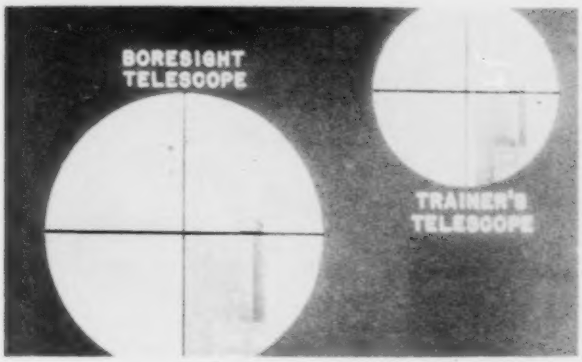
Now line up the horizontal wire of the pointer's telescope by turning the adjusting screws with the special socket wrenches.



In the pointer's telescopes the horizontal wire is now on the target at the same instant as the horizontal wire of the boresight telescope. In the same way. . .

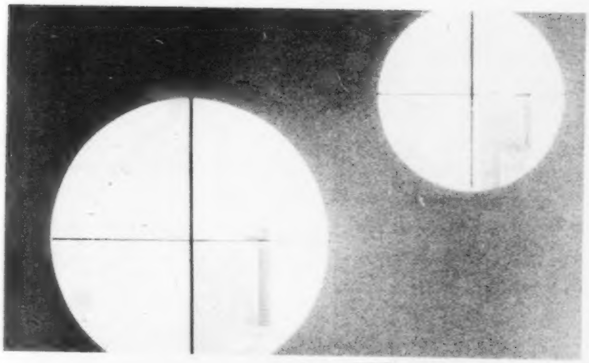


. . .the trainer adjusts his horizontal crosswire if he fails to come on the target as the boresighter "marks."

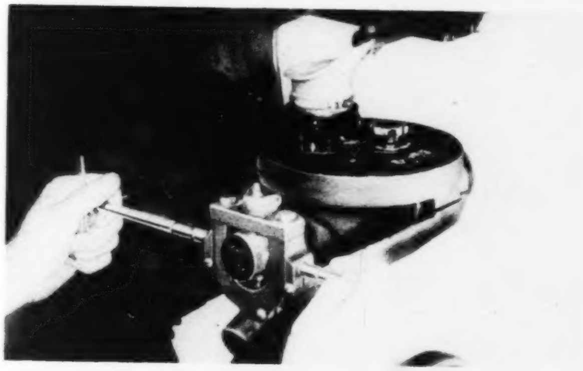


The horizontal crosswire of the boresight telescope now checks with the horizontal crosswire in the trainer's telescope. To check the adjustment of the trainer's vertical crosswire. . .

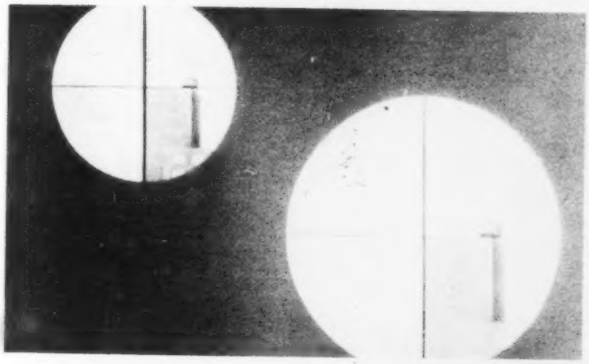
. . .the boresighter must "mark" when his vertical crosswire is on the target. If the trainer's vertical crosswire is in alignment, it will be on the target at the same instant the boresighter "marks." If not, the trainer brings it on. . .



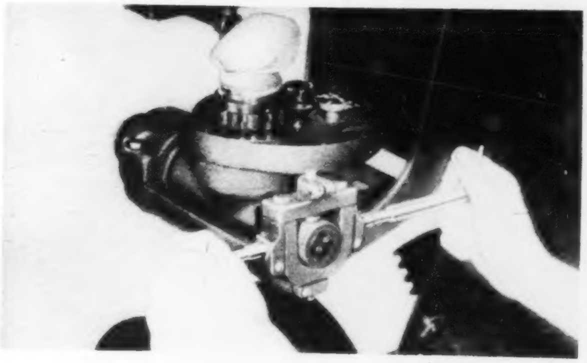
. . .by adjusting his telescope horizontally. In like manner. . .

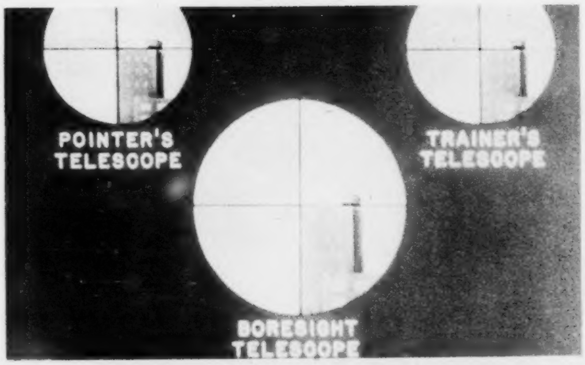


. . .the vertical crosswire of the pointer's telescope is now brought on, if necessary, as the boresighter "marks",. . .

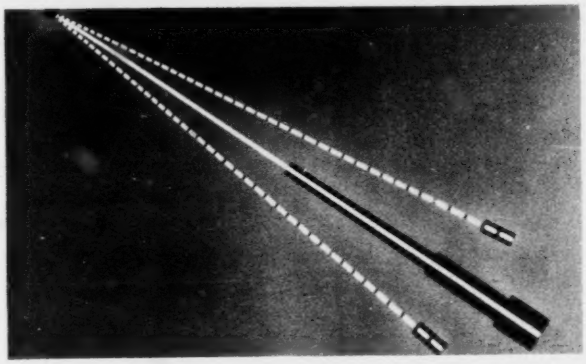


. . .by adjusting the pointer's telescope horizontally.

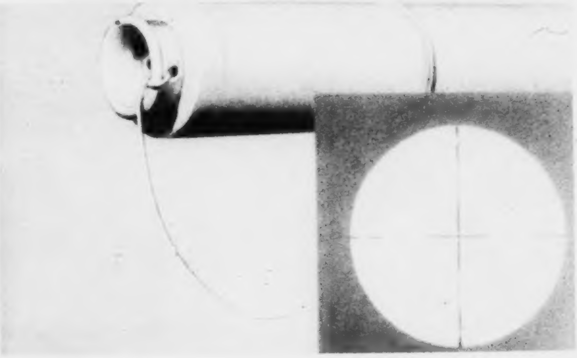




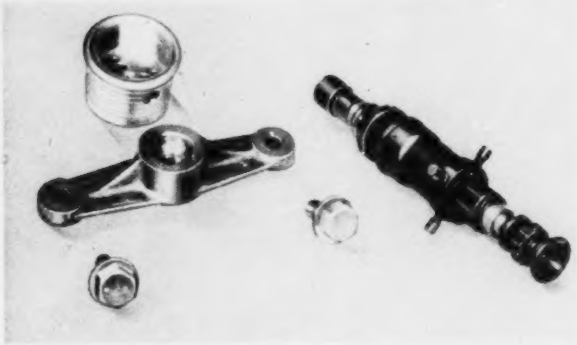
The gun is now boresighted—that is, the pointer's telescope and the trainer's telescope bear on the target in the same way as the boresight telescope.



On a properly boresighted 3"/50, the lines of sight of the pointer, trainer and boresighter converge at 5000 yards. The three men now change stations and check one another's work.

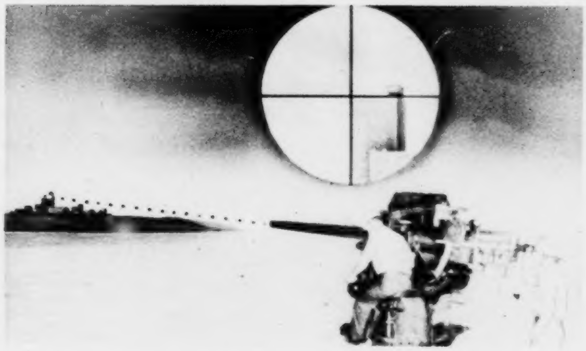


Replace the muzzle disc and check to make sure the boresight telescope did not move during boresighting. If it did not, the results may be accepted as accurate.



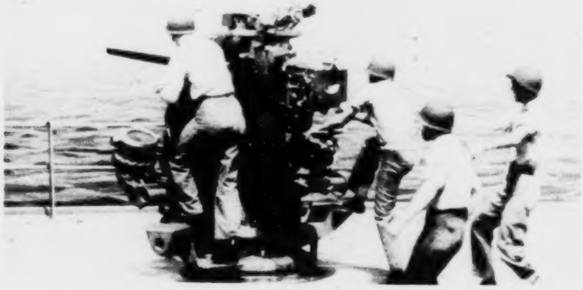
Now remove the boresighting equipment—the breech bar, muzzle disc and boresight telescope.

Remember that boresighting is always necessary after reassembly of the sight mechanism and after removal of the telescopes. It is the only reliable means of aligning the telescopes with the axis of the gun bore.

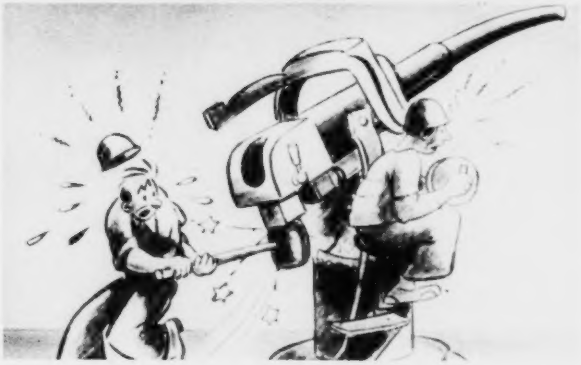


MAINTENANCE OF THE GUN

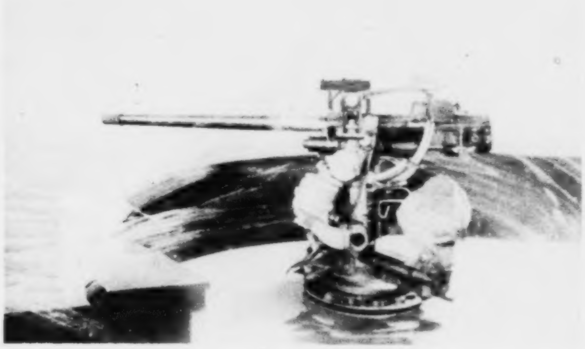
The 3"/50, like every naval weapon, must always be ready for instant use. The continuous painstaking maintenance work that keeps guns in condition for action at anytime is the Gunner's Mates most important duty.

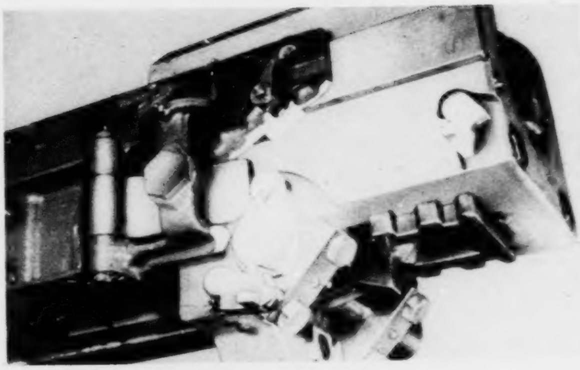


The 3"/50 isn't likely to collapse suddenly like the deacon's one horse shay, but a lot of its parts can go wrong if they are not carefully maintained.

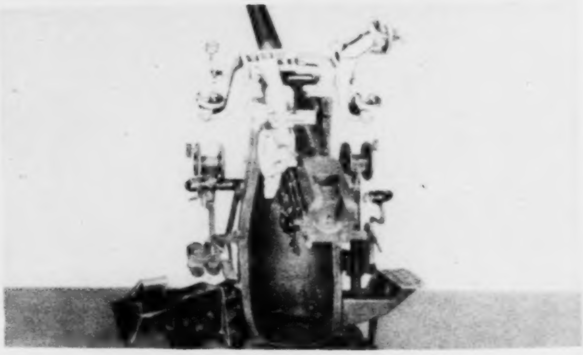


The mount is never enclosed. Constant exposure to sea and weather will cause corrosion and binding unless all working parts are kept well cleaned and properly lubricated. These parts are also subject to wear and accidental damage. So adjustments and replacements must be made from time to time. A well organized maintenance routine is the only certain means of assuring easy train and elevation,





dependable operation of the breech mechanism, reliable response of the firing mechanism



and smooth accurate action of the sight. We're going to study now the Navy's routine procedures which provide for proper maintenance of all parts of the 3"/50.

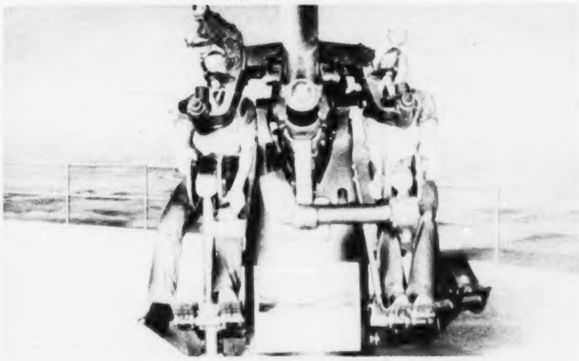
3 50 CAL GUN
3 50 CAL GUN
MONTHLY ROUTINE
3 50 CAL GUN
ROUTINE
PROCEDURES

These routine procedures are included in daily, weekly, and monthly check-off lists of maintenance duties that must be performed as directed. Let's start with the procedures on the daily list.

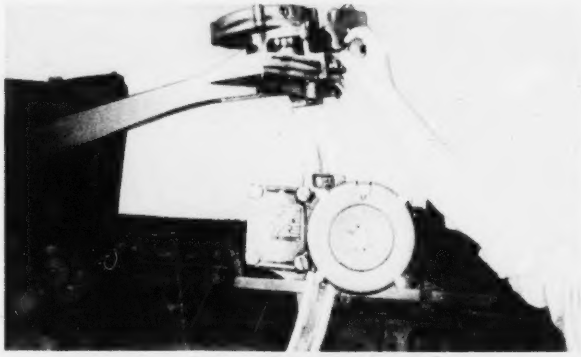
3 50 CAL GUN
DAILY
CHECK-OFF
LIST

The daily check-off list includes procedures that keep the gun exercised and ready for combat.

Each day the gun must be run through full ARC of train and elevation several times. Make sure there are no obstructions in the line of fire.

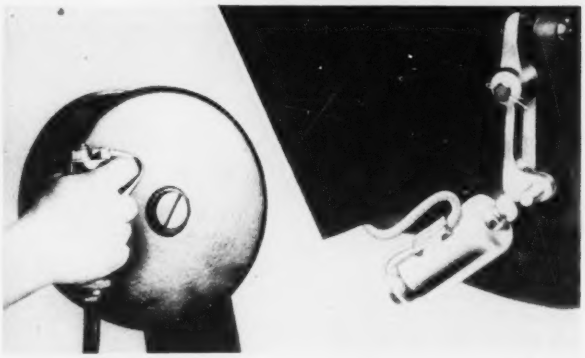


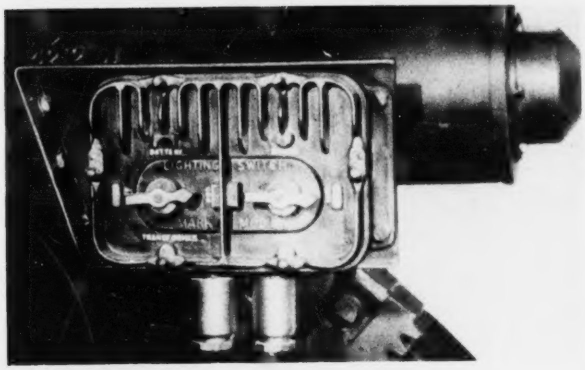
Also daily, operate the sight mechanism a number of times within the full limits of sight angle and deflection.



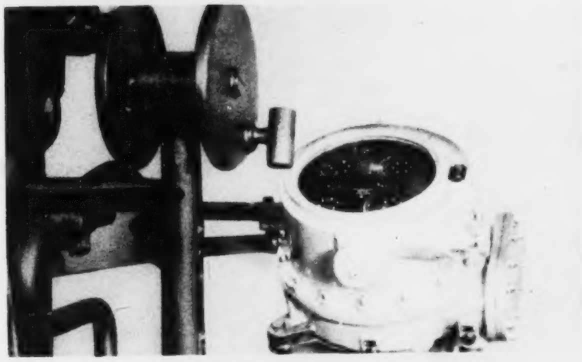
Depress the foot firing treadle three or four times. Don't forget to recock. If you hear the firing pin being released, you will know that the foot firing and firing mechanisms are responding properly.

Close the firing key to make certain that the electrical firing circuits and the solenoid are in good operating condition. If they are, you will see the solenoid move the trigger, and will hear the firing pin being released.

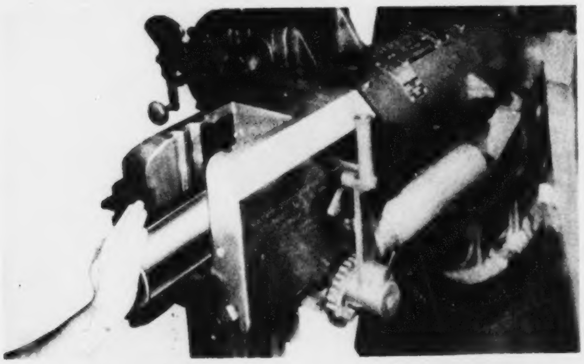




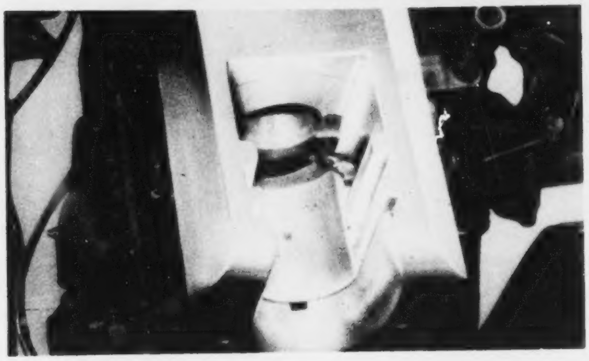
At the lighting switch panel check the lighting system on the transformer and battery circuit and on both the dim and bright setting. Replace any defective bulbs.



If the gun has indicators that are connected to a director, make a transmission check to see that the director signals are being received properly.

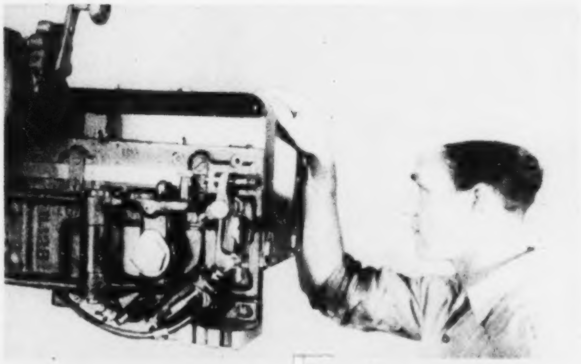


Ramming a test case will show up any faults in the operating spring and extractor assembly. Make this check several times, being sure the firing pin cocks each time as the block rises.

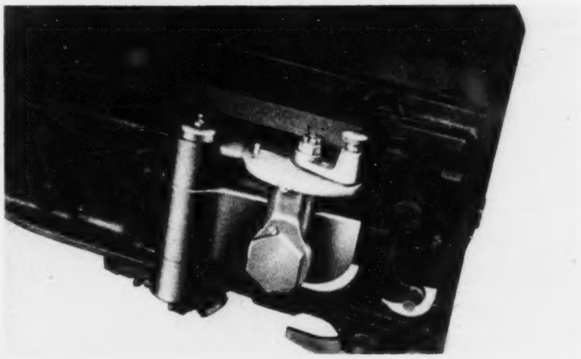


Then, inspect the breech block guide groove for burrs and foreign matter.

Examine the bore carefully from the breech end to make sure that it is clean and free of obstruction.

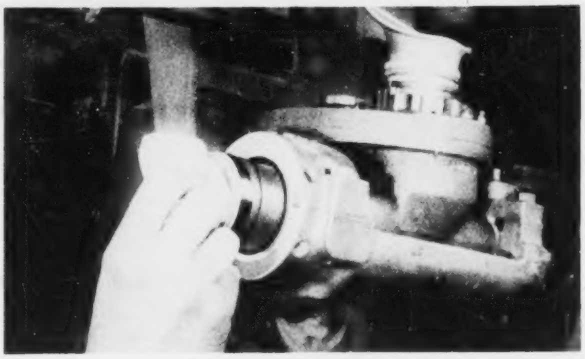


Test the cam plate retractor to see that it is working properly and make sure that it is left on the "A" setting.

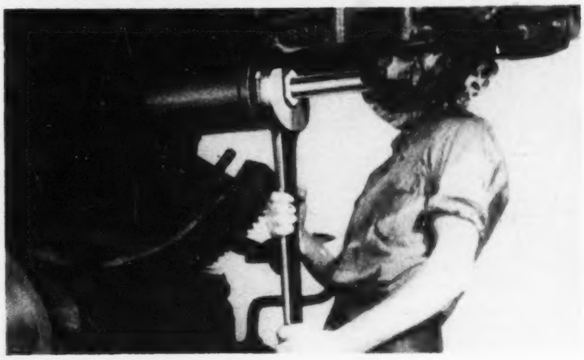


The fuze setter is tested with a dummy projectile. The reading on the fuze should agree with that on the outer dial of the fuze setter.

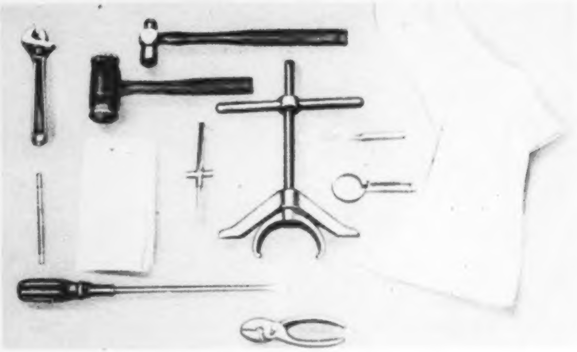
Clean the telescope lenses with lens paper and see that the eye guards are in good condition.



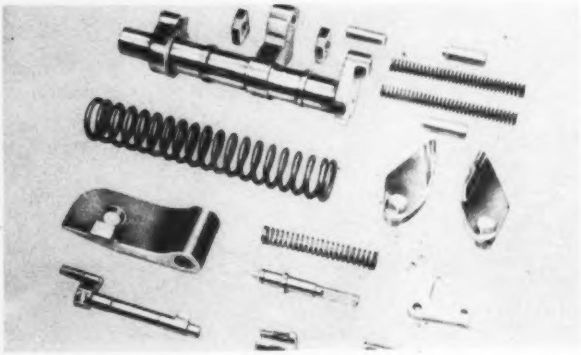
The addition of recoil liquid is necessary if the liquid in the recoil cylinder does not come up to the bottom of the filler hole when the gun is at maximum elevation. If the system leaks. . .



. . .tighten the packing nut at the after end of the recoil cylinder, or, if this fails, replace the packing.

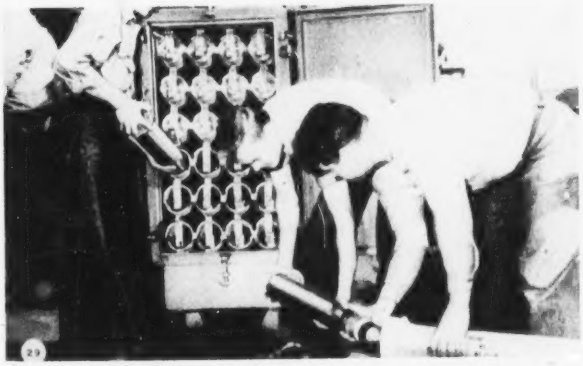


Make sure all the ready tools and accessories are at the gun and in good condition. . .



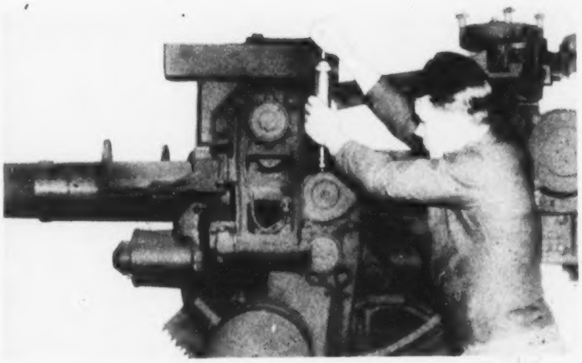
. . .and that all the necessary spare parts are on hand ready to replace any parts that may fail.

The ready service lockers must be checked systematically to make certain they are filled with ammunition. Check the condition of the ammunition and the readings of the maximum and minimum thermometer.



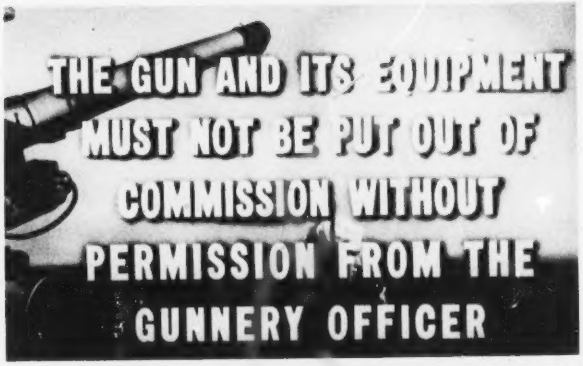
In following the daily lubrication chart, be sure you apply the right lubricant at the right place, and that you get to all the places listed. One fitting that has been passed up a few times can be the cause of a casualty.

Learn the lubricating methods that get a better job done. It's best for example to lubricate the trunnions with the gun at zero elevation so that the grease grooves are in position to carry the lubricant to all parts of the bearing surfaces. Thorough lubrication is the last routine procedure on the daily check-off list.



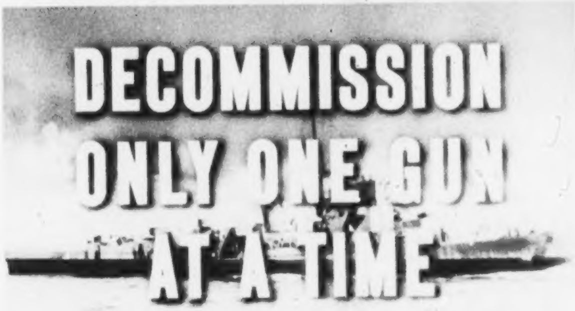
The weekly check-off list includes procedures which may require the removal and replacement of working parts. If these jobs should make it necessary to put the gun out of commission, remember. . .

3"-50 CAL GUN
WEEKLY
CHECK-OFF
LIST



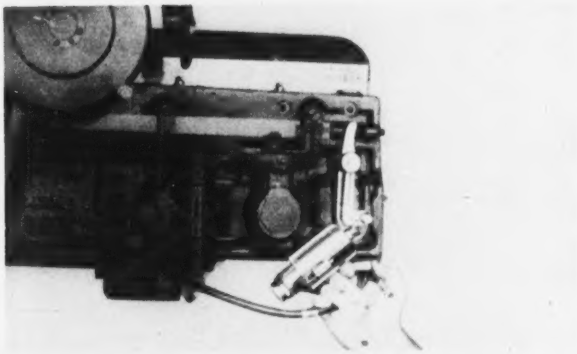
THE GUN AND ITS EQUIPMENT MUST NOT BE PUT OUT OF COMMISSION WITHOUT PERMISSION FROM THE GUNNERY OFFICER

. . .the gun and its equipment must not be put out of commission without permission from the gunnery officer. Remember also,

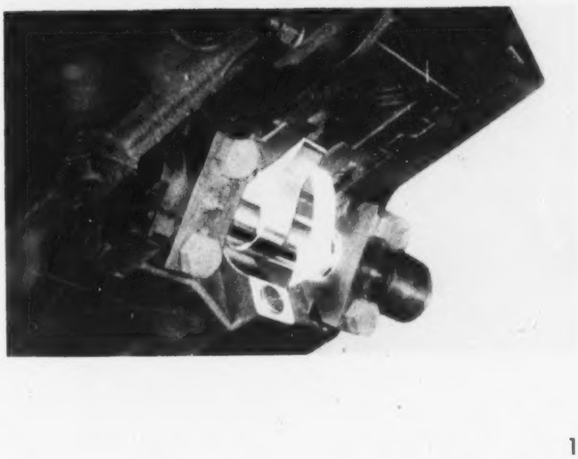


DECOMMISSION ONLY ONE GUN AT A TIME

decommission only one gun at a time. Now let's work our way through the weekly check-off list.

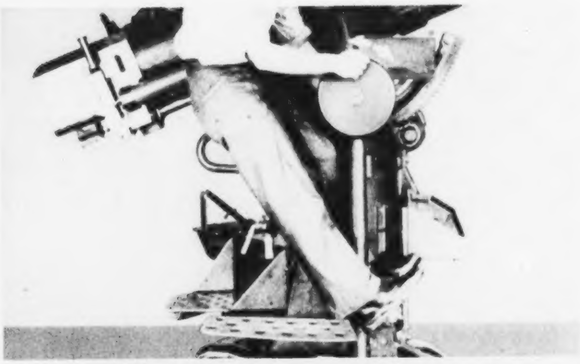


Inspect all electrical circuits for broken leads and loose connections. Repair work when necessary must be done by an electrician's mate.

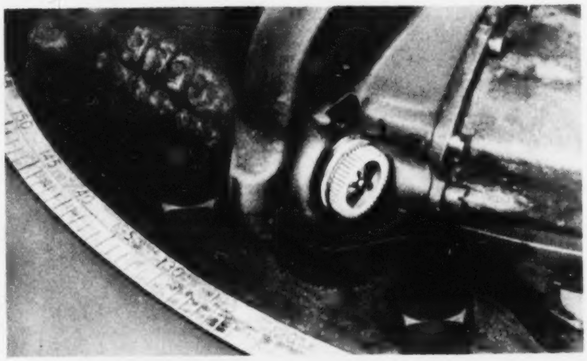


Check the fiber disk which absorbs shock when the central arm of the operating shaft contacts the breech housing. If this disk is not in place or is in poor condition, replace it.

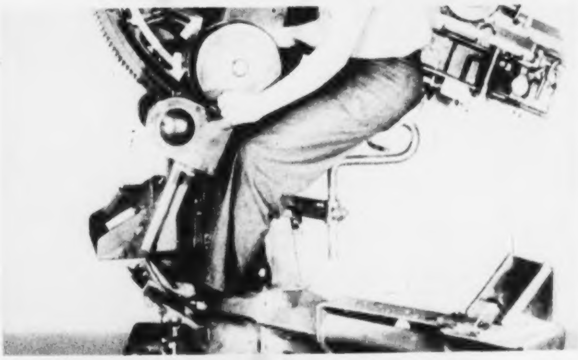
Then turn the pointers handwheels back and forth slowly to see if they cause immediate elevation and depression of the gun. If they do not, the lost motion and the gearing is removed. . .



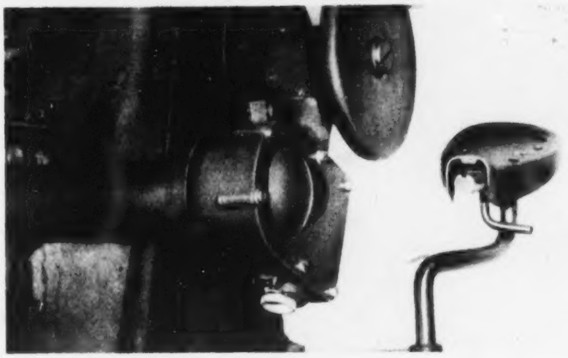
. . .by tightening the adjusting bushing on the forward face of the worm bracket. If this procedure does not eliminate all lost motion, remove shims between the bracket and the carriage.

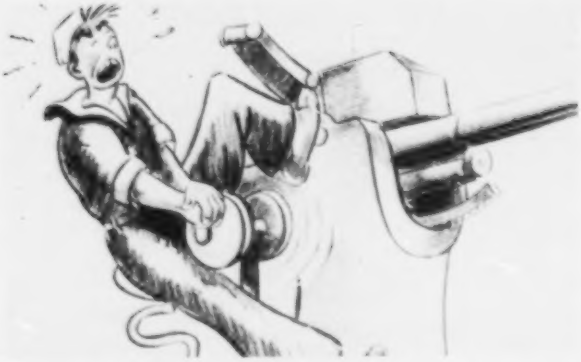


Turn the trainer's handwheels back and forth slowly through part of A revolution to test for lost motion. If any lost motion is present, it may be removed. . .

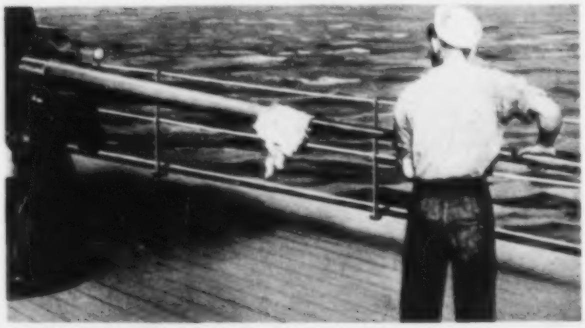


. . .by tightening the adjusting bushing on the underside of the pointers elevation gear bracket. If this does not eliminate all lost motion, remove shims between the elevation pinion bracket and the carriage.

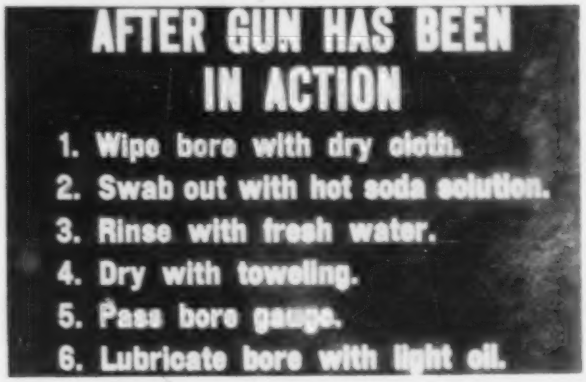




Don't bind the trainer's or pointer's handwheels by tightening down too much on the adjusting bushings or by removing too many shims. Lost motion is bad, but binding can be worse.



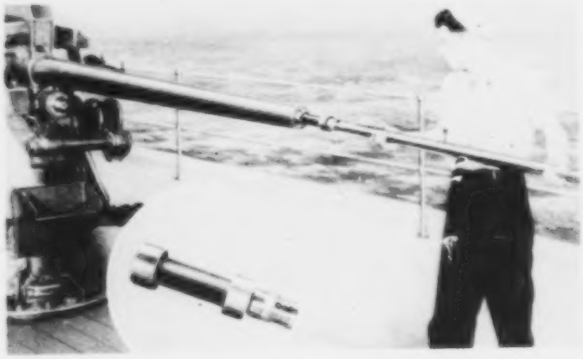
Cleaning the surface of the gun bore to remove corrosion is the next job on the weekly check-off list. The bore is first dry sponged with clean toweling wrapped around the bristle bore sponge. Then a protecting film of light oil is put on the bore surface by running through the bore with a oil soaked cloth wrapped around the bristle sponge.



AFTER GUN HAS BEEN IN ACTION

1. Wipe bore with dry cloth.
2. Swab out with hot soda solution.
3. Rinse with fresh water.
4. Dry with toweling.
5. Pass bore gauge.
6. Lubricate bore with light oil.

After the gun has been in action remove all combustion products from the bore. First, wipe the bore with a dry cloth around the bristle sponge, then swab it out with a hot laundry soda solution. Next, rinse the bore with fresh water and dry it with toweling. Then pass the bore gauge through the bore to determine if there are any copper deposits on the lands. If the gauge passes through freely, lubricate the bore with light oil.

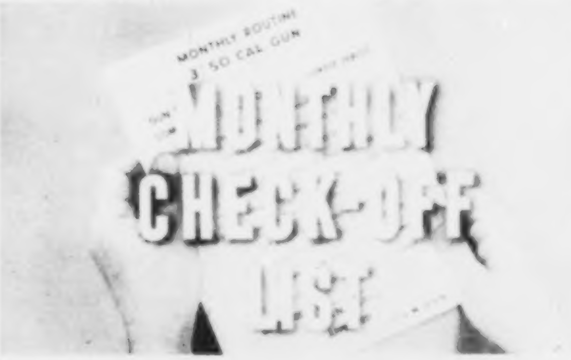


If the bore gauge shown in the inset will not pass freely because of copper deposits, the constriction must be worked over. . .

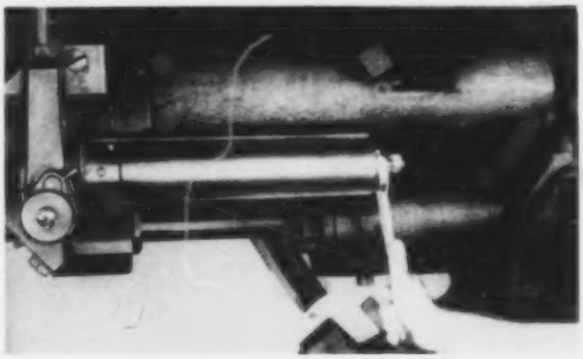
. . .with a lapping head fitted with emory cloth or with wire brush. The lapping head or brush should run back and forth until enough copper is removed to allow the bore gage to pass freely. Use the lapping head or wire brush only when the constrictions are to save wear on the remainder of the bore. Do not attempt to remove smoke rings or other discoloration. When the bore gage passes through freely, clean and oil the bore as previously described.

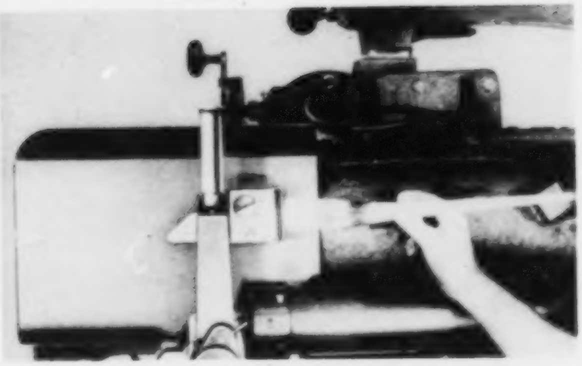
Following the weekly lubrication chart is the last of the weekly procedures.

The monthly check-off list includes operations and inspections at sea and in port. We'll first consider those conducted at sea.

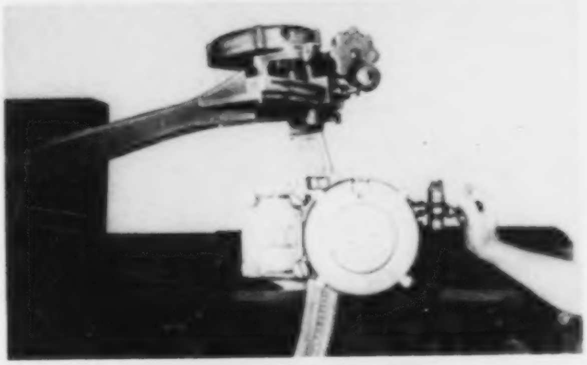


The operating spring is adjusted to provide smart breech closing action. The rod nut must never be so tight that the spring is fully compressed when the breech is open.

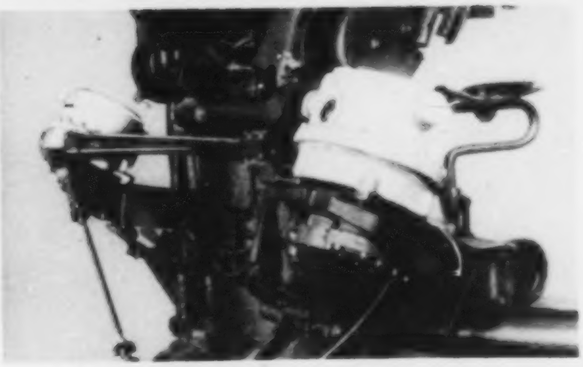




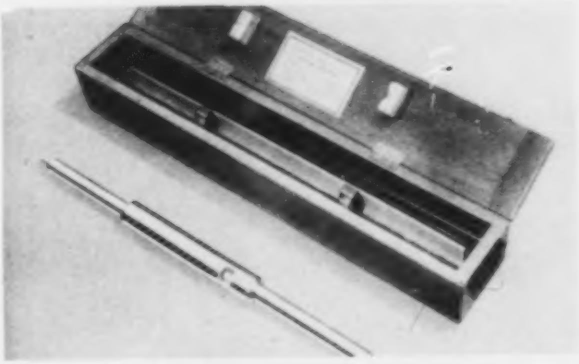
The back to battery markings must be repainted on the breech housing and slide.



If turning the sight setters hand wheel does not cause immediate movement in the sight, the lost motion must be eliminated by replacing worn gears. When water has entered the gear brackets, remove the covers and clean and lubricate all parts inside. Then replace the cover.

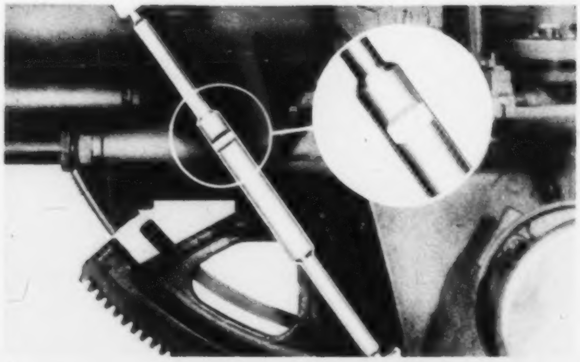


If the gun has elevation and train indicators that are connected to a director, the readings of these indicators must be checked each month against the actual train and elevation of the gun. This is done with a measuring device. . .

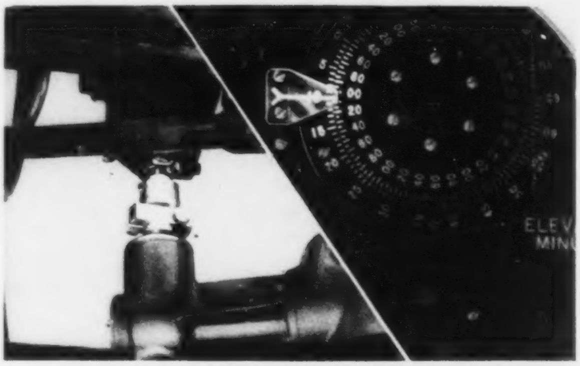


. . .called a tram bar. Inside the cover of the box is a list of the correct indicator readings for each 3"/50 on the ship. To check these readings in elevation. . .

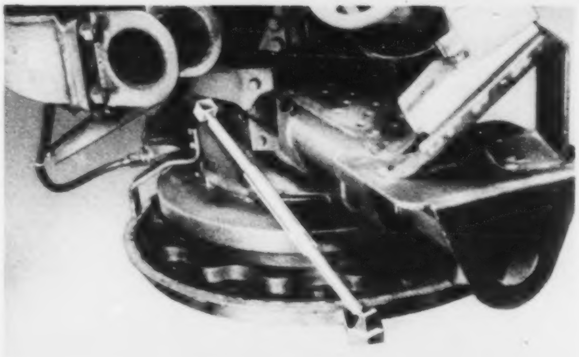
. . .the pin ends of the tram bar are inserted in two tram blocks, one on the right side of the slide and one on the right carriage cheek. Elevate or depress the gun until an index on the tram plunger matches an index on the tram barrel. At this point the elevation indicator reading should correspond with the angle of elevation recorded for this gun on the box cover. If the readings do not agree, . . .



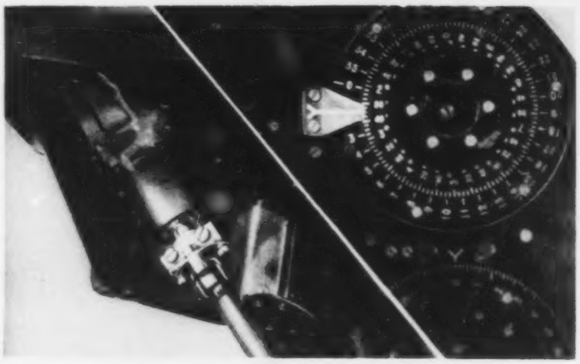
. . .adjust the vernier coupling on the elevation input shaft below the pointers handwheel bracket until the angle of elevation shown on the indicator dial agrees with the angle recorded on the box cover. The train indicator is checked in a similar manner.

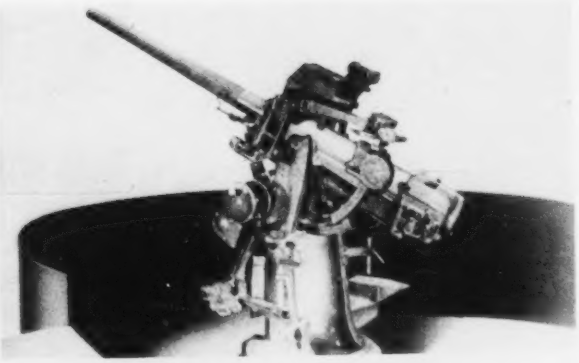


Train them out until the index marks on the tram match. At this point the train indicator reading should correspond with the angle of train recorded on the box cover. If the two do not agree, . . .

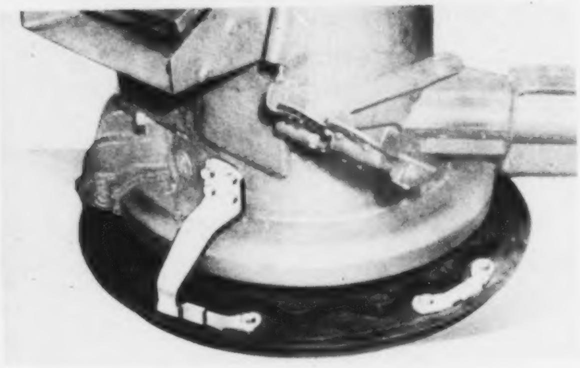


. . .adjust the vernier coupling on the train input shaft until the angle of train shown on the indicator dial agrees with the angle recorded on the box cover. The gun has now been trammed in train and elevation.





Inspect the entire gun and mount for evidences of corrosion on any unprotected surfaces.



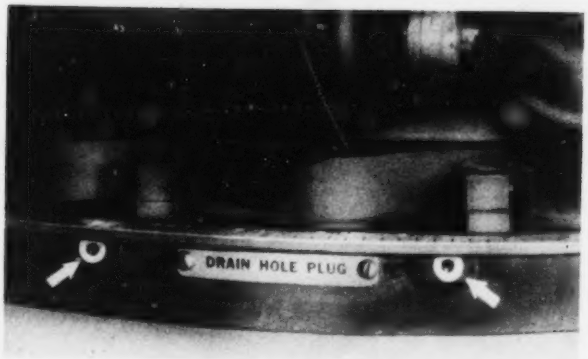
Examine the training stops and training stop bracket to make certain that all bolts are drawn up firmly.

A burred or dented round might jam in the gun with serious results; therefore, every round in the ready service lockers must be inspected monthly. Remove any that are burred or damaged.

MONTHLY LUBRICATION CHART
3 50 CAL GUN

Next, follow the monthly lubrication chart carefully. Before you lubricate the inner and outer stand bearing assemblies included in this chart, you must do an important maintenance job.

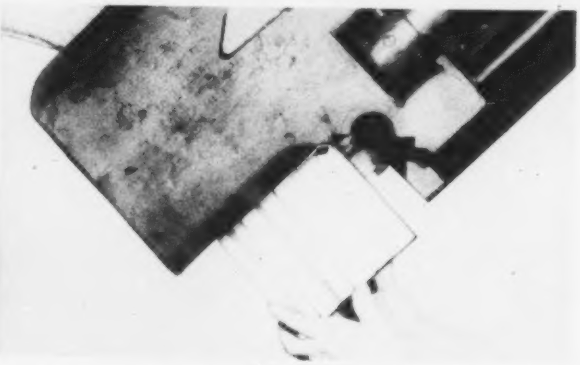
Remove four drain plugs from the stand, train the mount all the way to the right or left several times to force out any water that may be present around the bearing. If the drain holes are stopped up with grease, free them by running a wire through each opening. Then replace the plug and force in the lubricant, training the mount at the same time to insure proper distribution. If monthly lubrication is not sufficient to keep the stand bearing assemblies in good working order, lubricate weekly. We come now to. . .



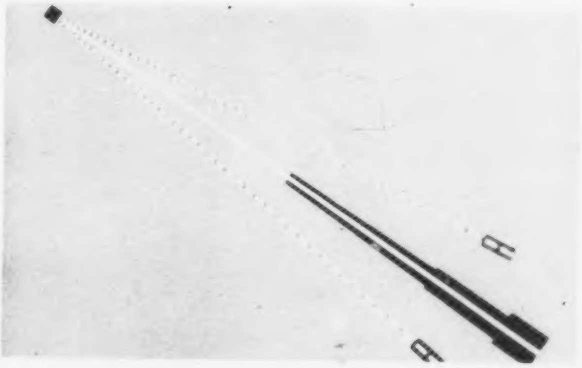
. . .operations in port. The first of these is. . .

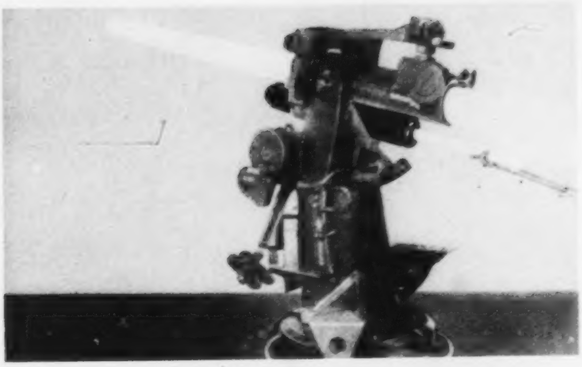
OPERATIONS
IN PORT

disassembly and reassembly of the breech mechanism which we have already studied.

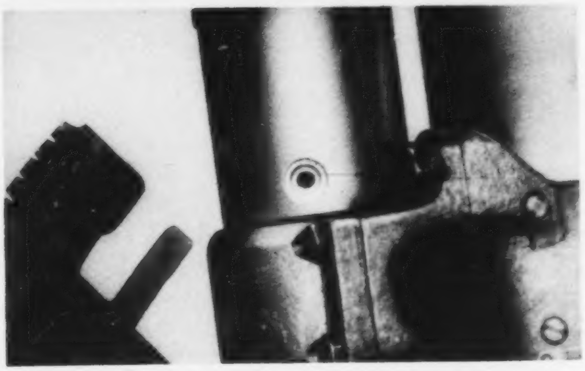


Another is boresighting which has also been fully described. We have not yet explained the operation. . .



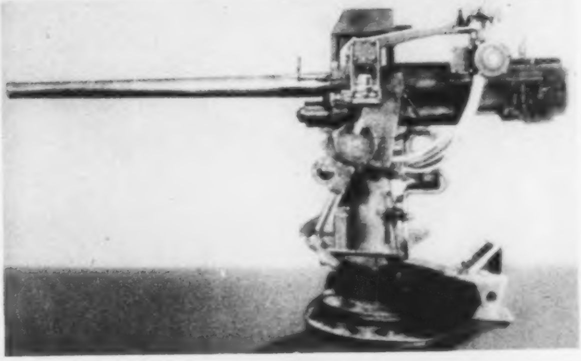


. . .of running the gun out of battery, which means pulling it aft to the position of full recoil so that parts not ordinarily exposed. . .



. . .for inspection may be examined for burrs and corrosion. At this time also the recoil and counterrecoil systems and the automatic operation of the gun should be checked over. To prepare for running out of battery, . . .

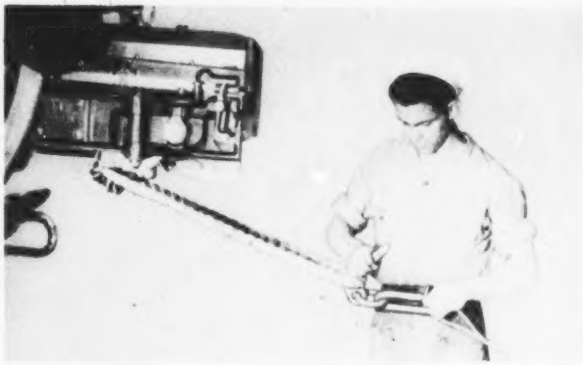
. . .first elevate the gun to 85° and check the level of the recoil liquid, adding liquid if necessary. This is done to provide normal operation of the recoil and counterrecoil systems as the gun goes in and out of battery.



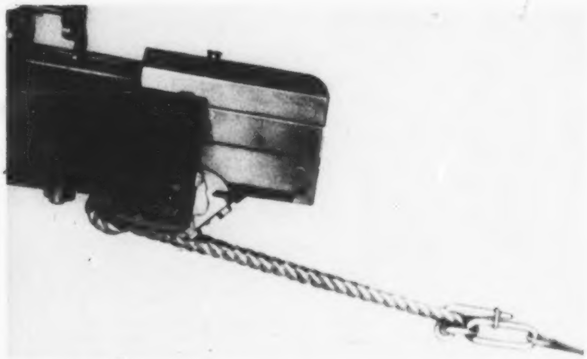
Set the gun at zero elevation so that maintenance job can be handled most conveniently.

Set the camplate retractor at "A" and ram a test case so that the automatic operation of the gun and the ejection of the case may be checked.

Now to a sling attached to the breech housing connect a pelican hook secured to a chain fall. With the other end of the chain fall secured aft of the gun. . .

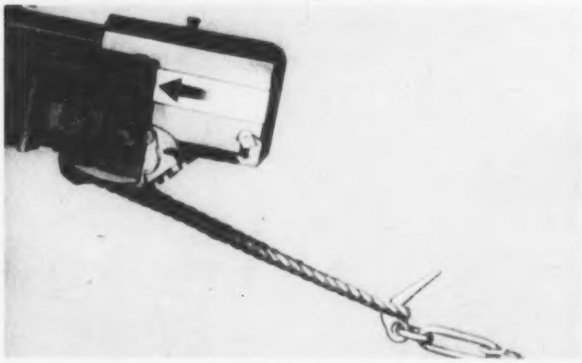


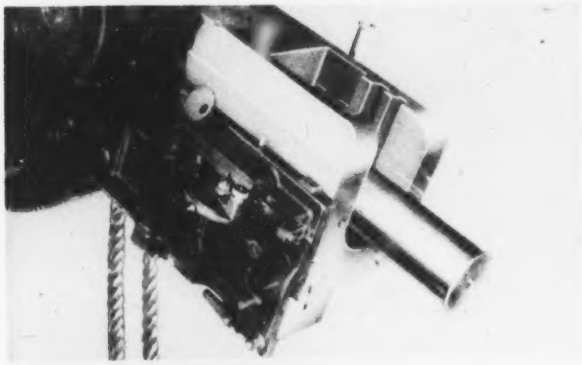
. . .pull the gun out of battery to the position of full recoil. Now holding it in this position. . .



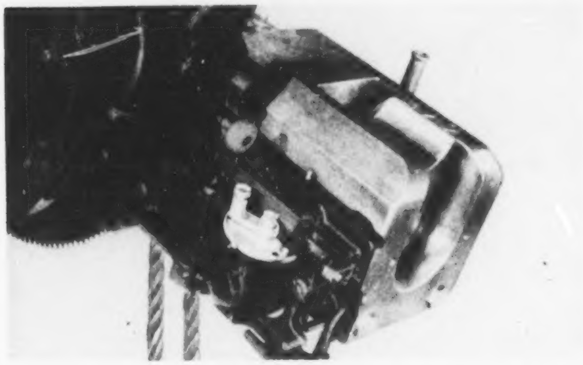
. . .check for burrs and corrosion on the bearing surface of the barrel, the after face of the slide cylinder, the forward face of the breech housing and the forward section of the recoil piston rod. After smoothing and cleaning these surfaces,. . .

. . .trip the pelican hook permitting the gun to counterrecoil. Repeat this several times with a test case until you are sure. . .

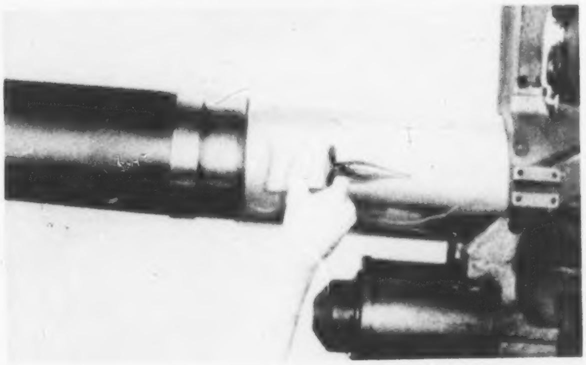




. . .that the block dropped and the case is properly ejected during each counterrecoil movement. Then repeat the entire procedure. . .



. . .with the cam plate receiver set at "S." Make certain in this case that the block does not drop as the gun counterrecoils. Now remove the sling from the breech housing, . . .



. . .check the lubrication of the slide, and clean all exposed parts. Apply a coating of heavy grease to such surfaces as the forward section of the gun slide cylinder which is exposed to the weather. This completes the monthly maintenance operations in port.

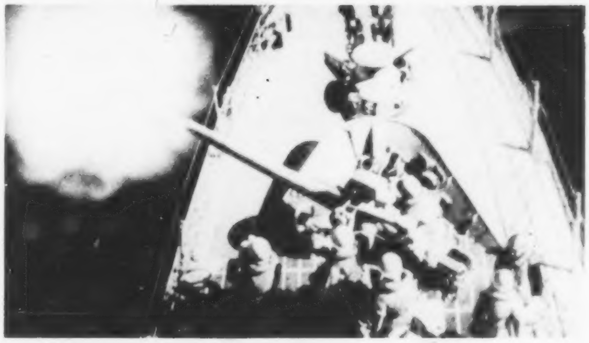
SEMI-ANNUALLY
CHECK ALKALINITY OF
RECOIL LIQUID

Semiannually check the alkalinity of the recoil liquid with a solution of phenol saline as specified in OD 1914. If this shows the liquid to be acid, replace it with new liquid.

Once a year lift the carriage and gun from the stand and carefully inspect the bearings, bearing paths, training circles and other parts normally hidden from view.

ANNUALLY
LIFT CARRIAGE
INSPECT
BEARING
SYSTEMS

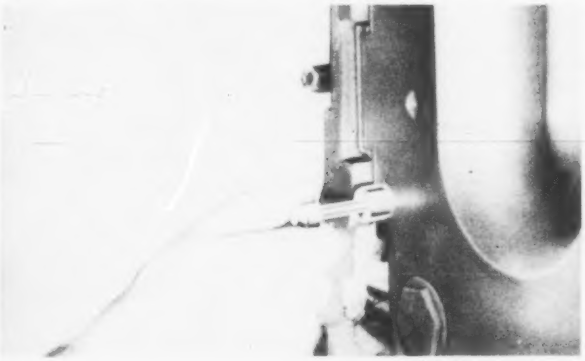
You can depend on your gun in action if you have followed all the check-off lists. These procedures provide for the maintenance attention that the gun needs to keep it in good working condition at all times.

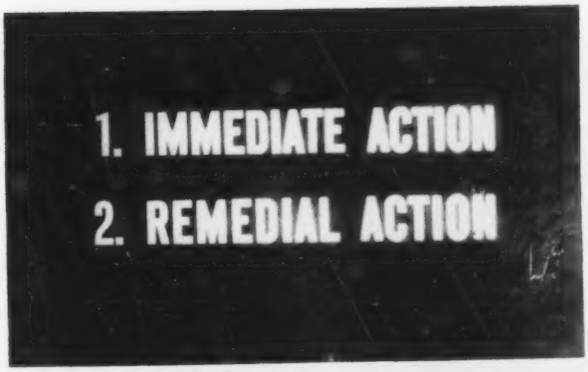


OPERATIONAL CASUALTIES

NARRATOR: A well maintained 3"/50, manned by a trained crew, will deliver a good rate of fire with a minimum of operational casualties. The casualties that do occur are caused mostly by carelessness of the crew, or weak or broken parts, or by foreign matter between close-fitted parts. When the gun stops firing during an engagement, a good gunner's mate will quickly locate the cause of the stoppage.

For example, if it's a stuck sear piston he should be able to analyze the trouble and trace it to this part. He'll be ready, also, for the two kinds of action required of him. These are. . .



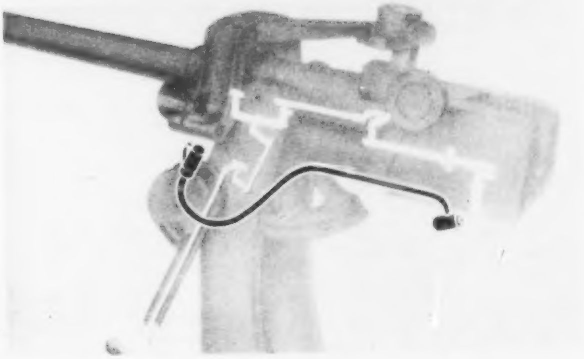


1. IMMEDIATE ACTION
2. REMEDIAL ACTION

. . .immediate action, which will keep the gun firing to the end of the battle,—and remedial action, which will get to the bottom of trouble and put the gun into tip-top shape, all set for the next engagement. Now let's take a look at one of the most common casualties. . .

MISFIRE

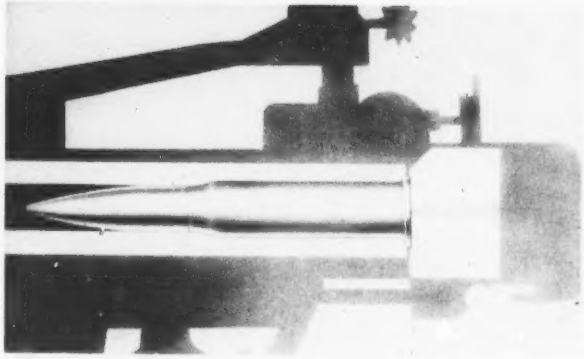
. . .misfire, which is any failure of the gun to fire. Misfire may be due to a defect. . .



. . .in the electrical or mechanical firing system,. . .

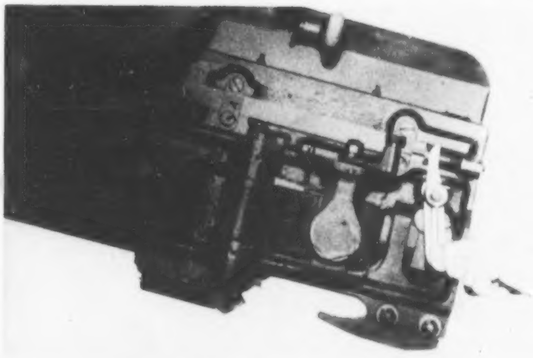
. . .a faulty firing mechanism. . .

. . .or defective ammunition. Now, how do we find where the trouble is? The logical first move is to check the parts that are in the open, and that can be tested most quickly.

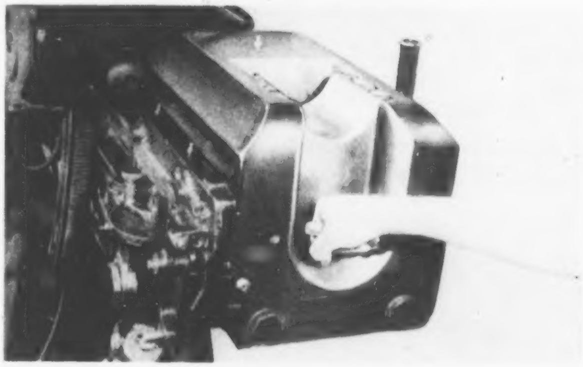


So the pointer again squeezes his firing key, and at the same time depresses his foot-firing treadle. He must make sure he actually closes the key and fully depresses the treadle. The first loader should then see the trigger mechanism operate. If the trigger does not trip. . .

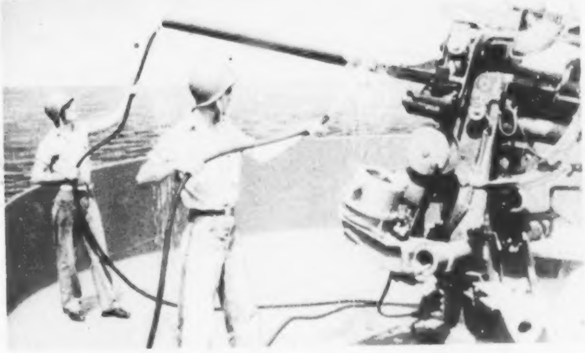
. . .he must operate it by hand. If this causes the gun to fire, the first loader continues to fire by hand until the engagement is over. At each attempt to fire he must make sure that the firing pin is cocked. If it is not. . .



. . .the recocking tool is used to cock the pin. Now, assuming that the firing pin cocks and releases properly, but without causing the gun to fire, it is clear that we have two possible explanations. Either the striker point of the firing pin is not striking the primer—or, the ammunition is defective.

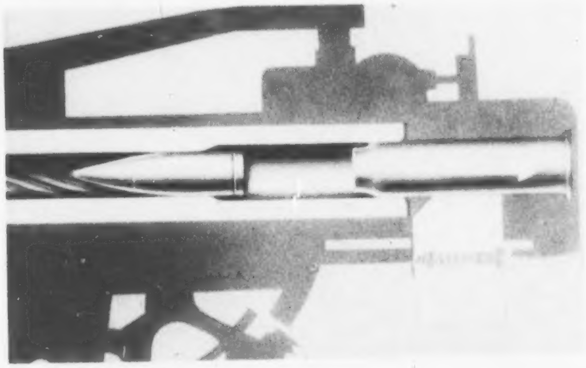


In battle, the round should be removed quickly to return the gun to action, but wait twenty seconds to allow for a hangfire. In practice, or if the round cannot be removed. . .



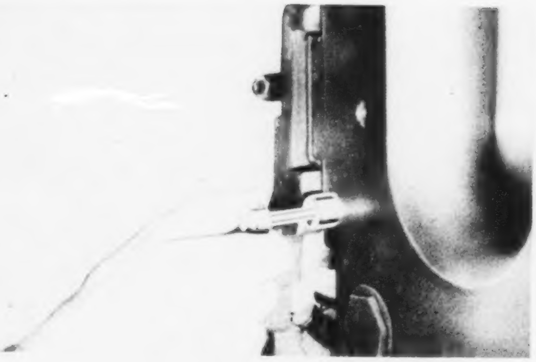
. . .you may be ordered to cool the gun and projectile with hoses, to prevent a cook-off explosion. Stand clear until the gun is cool.

Suppose you are ordered to unload the round and throw it overside. In attempting to remove the round, you may find. . .

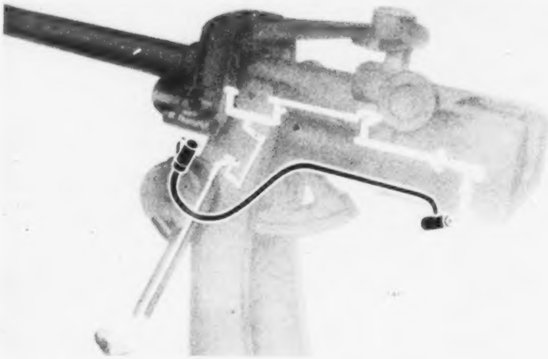


. . .that the projectile has become detached from the case and has stuck in the gun. Clear the bore by firing a short case. If the short case will not fire, it is probable that failure to fire is not due to faulty ammunition but is caused by a defective firing mechanism.

It may be necessary to replace the sear piston or other parts of the firing mechanism to return the gun to service. The possibility of a cook-off still exists. You may then be ordered to remove the short case, close the breech, and cool the gun with hoses.

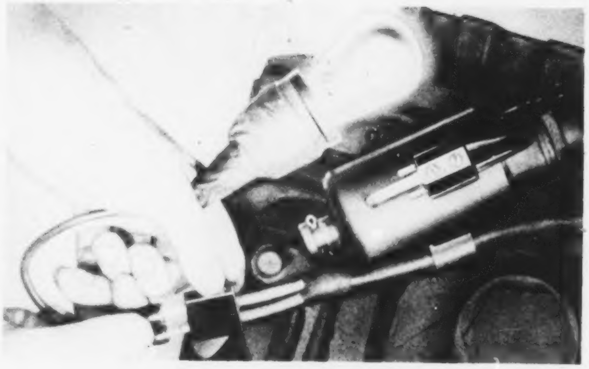


As soon as the engagement is over, the entire firing system must be checked to locate any defective parts that could cause a misfire. First check the electrical system by squeezing the firing key. If the solenoid does not operate,. . .

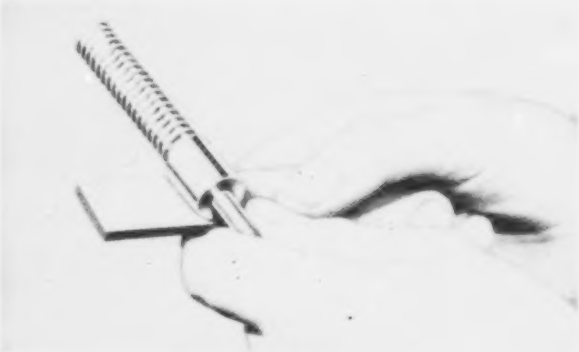


. . .use a test lamp to check the leads to the solenoid. Some solenoids operate at six volts, some at one hundred and ten—so be sure you have the right lamp. Before you start testing, be certain there is current to the gun and that the firing key is closed.

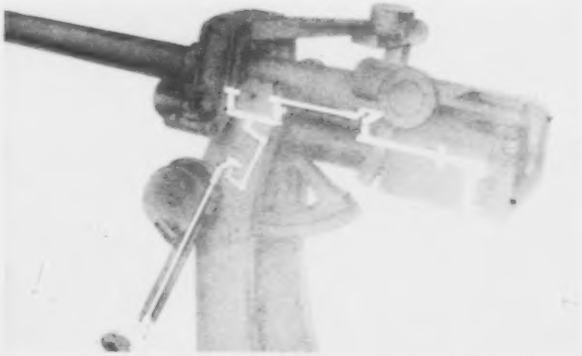
Touch the leads of the test lamp to the terminals of the solenoid plug. If the lamp glows, the circuit is all right to the plug—so the solenoid must be defective and must be replaced. If the lamp does not glow, the circuit is defective. This should be reported to the gunnery officer.



The firing mechanism must be disassembled for inspection and repair immediately after action if, for any reason, its performance was not entirely satisfactory.



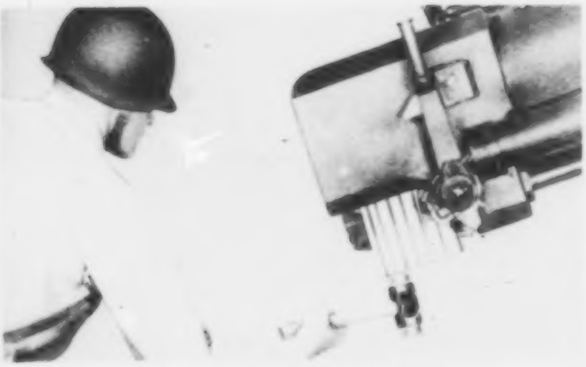
Stone down the sear piston and lubricate it carefully if it showed any tendency to bind in the breech housing, thus causing misfire.



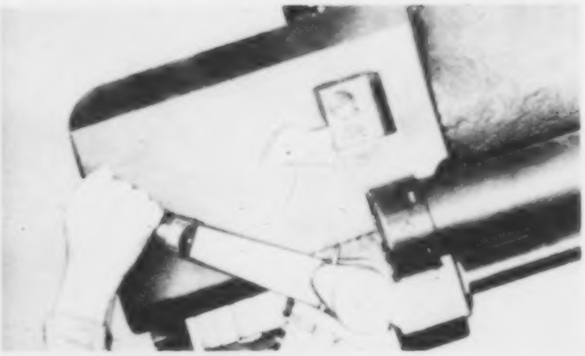
If the foot firing mechanism operated unsatisfactorily in action, check it for lost motion and inspect the setting of the adjusting screw on the trigger pull bar. Be sure the gun does not fire automatically on breech closure unless the firing key or foot-firing treadle is actuated, or unless the gun is equipped with a solenoid MK 14, MOD 1 or MK 28. Replace any obviously defective parts. If the linkage binds, disassemble, clean and lubricate it thoroughly and reinstall it on the gun. Now let's discuss. . .

. . .failure of the breech to close. If the first loader finds that the block does not come up all the way at the loading of a round, we have a casualty with two possible causes. Either the ammunition is defective, or the breech mechanism is at fault. Whatever the cause, the logical thing to do is to determine if the block will rise, given a little help. The first step in the immediate action procedure. . .

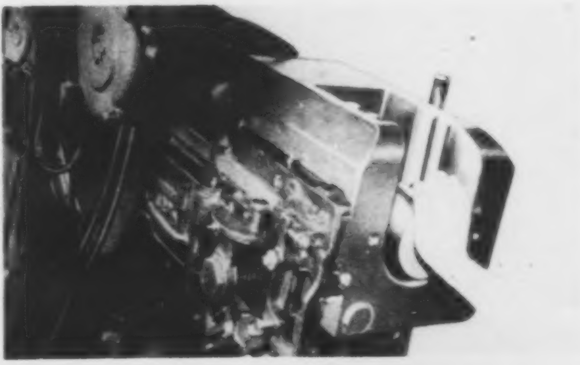
. . .is to tap the bottom of the breech block lightly with a rawhide maul. If the block closes, continue to use the maul when necessary, and keep the gun firing. If tapping with the maul does not raise the block, attempts should be made to raise it. . .



. . .with the hand operating lever. Do not force the block up if it cannot be raised with a reasonable amount of pressure on the lever; otherwise a more serious jam may result. If the breech block cannot be raised, it should be lowered with the hand operating lever, to eject the round in the gun. . .



. . .and permit the ramming of another round. If the breech can be closed on the new round, it may be assumed that the casualty was caused. . .

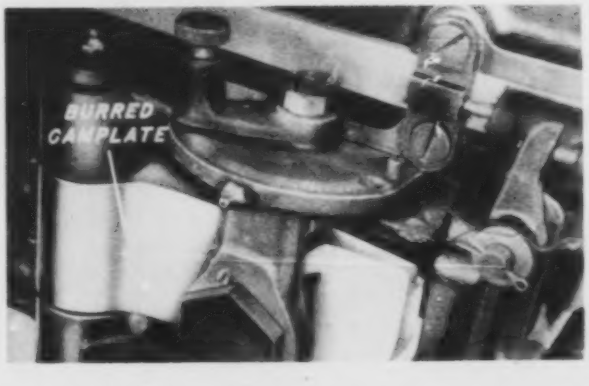


. . .by a damaged or oversized cartridge case. Damaged ammunition is a frequent cause of failure of the breech to close. But, if the block will not rise on the ramming of a new round, it may be assumed that the breech mechanism is at fault. With the gun bore clear to avoid a cook-off, see if there are burrs or foreign matter in the breech.

Try to remove any obstructions of this kind—if you can't, use the maul and keep the gun firing as long as possible.

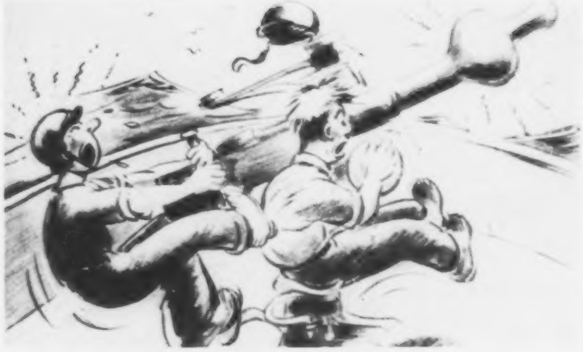
Should a weak or broken operating spring be the cause of the block's failure to rise, switch to single fire and use the band operating lever to open and close the breech. Do the same. . .

. . .if a broken or disconnected spring connecting rod or chain is preventing the plug from rising when a round is rammed.

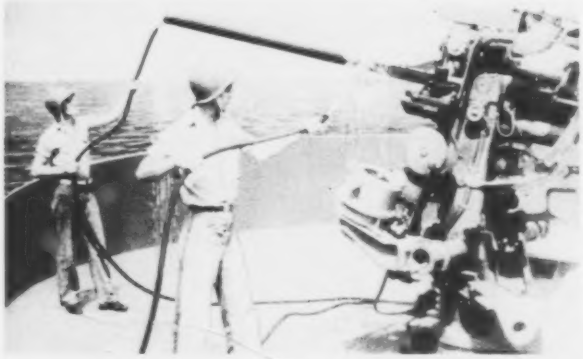


A burred operating shaft camplate may jam the operating shaft inboard, so that the bearing blocks freeze in the camways of the breech block to prevent movement of the plug. If this casualty occurs, you'll recognize it quickly, because the block can neither be raised nor lowered with the hand operating lever.

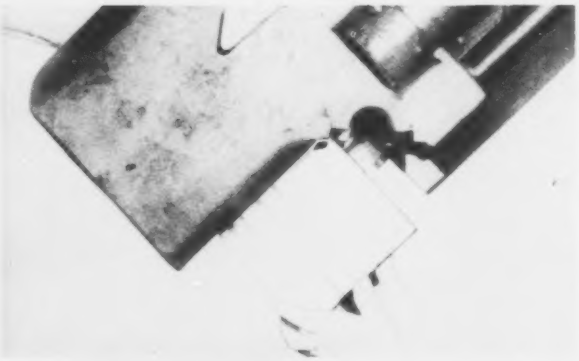
What can we do now? We can't fire the gun or remove the round because the breech block is jammed. If this stoppage occurs when the gun is hot, do not delay;. . .



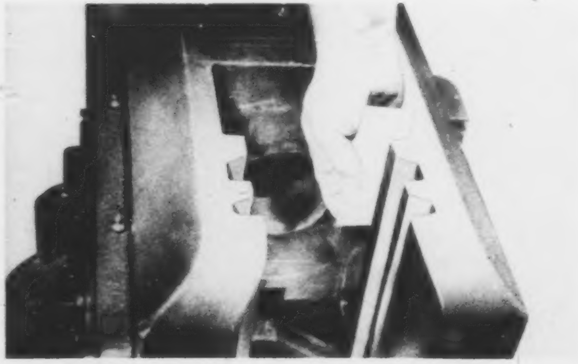
. . .run a stream of water in the bore from a hose set well down in the barrel; also play a stream on the outside of the barrel. This keeps the nose fuze cool and helps prevent the projectile from exploding. Keep all personnel clear during these operations.

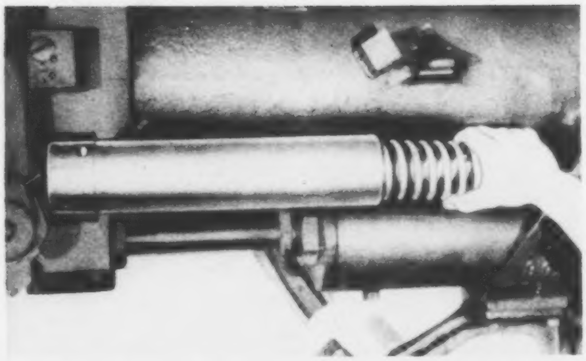


The remedial action to make the breech close properly is to disassemble and repair the breech mechanism. During disassembly. . .



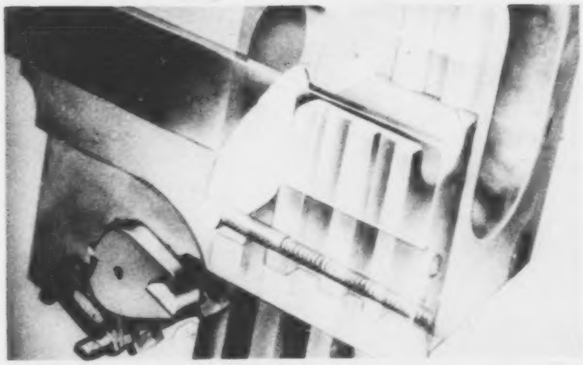
. . .stone down any burrs on the block guide grooves and carefully remove all foreign matter.



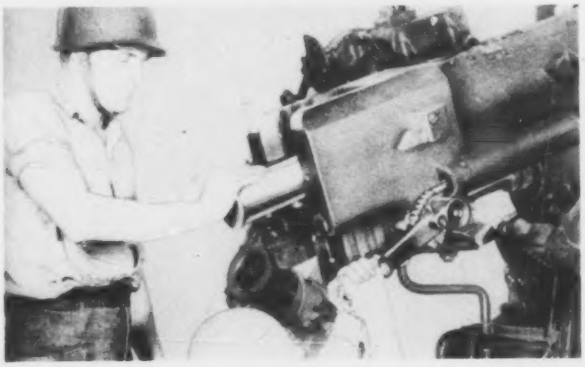


Replace the operating spring if it is found to be weak.

Also replace the operating shaft camplate if there are any burrs on it. Replace any other worn or broken parts that may have caused casualties in action.

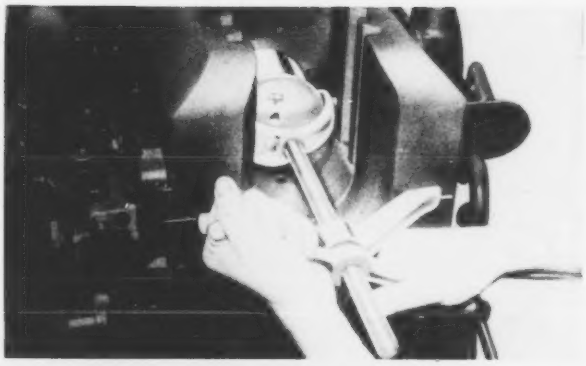


Worn or broken extractors can cause two casualties. If the lugs are worn, the block will not remain down. If the lips are broken, the empty case will not be extracted. In either case, the first step in the immediate action procedure is to switch to single fire while the engagement lasts. The next immediate action, in the case of worn lugs, . . .

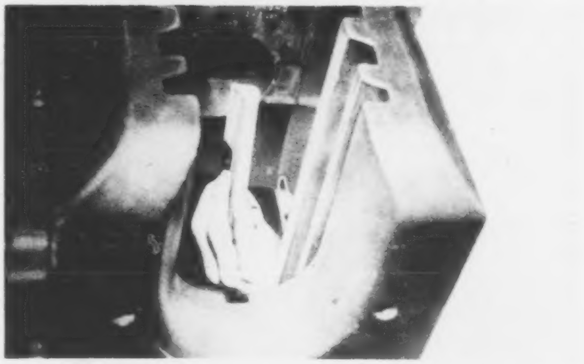


. . .is to hold the block down with the hand operating lever while the round is being rammed. Worn pallets on the breech block may also cause this casualty.

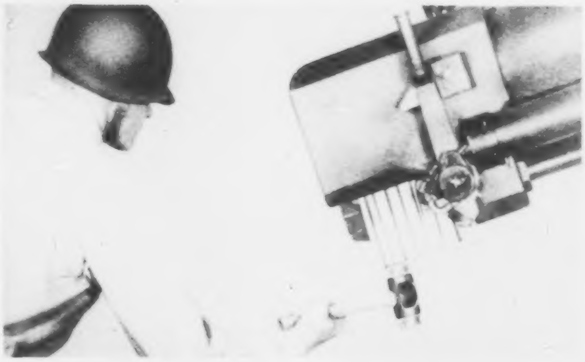
If the extractor lips are broken, remove the empty case with the hand extractor. At the first opportunity, follow through with the proper remedial action which, in this case, is to disassemble the breech mechanism,. . .



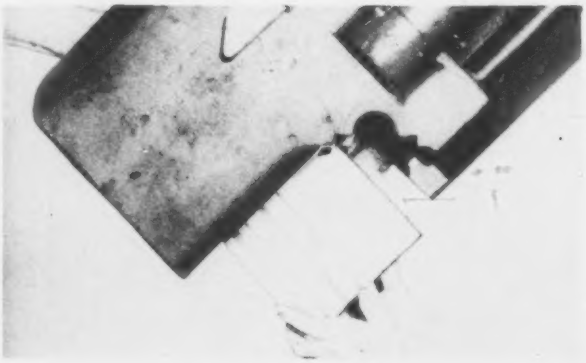
. . .so that worn pallets or defective extractors can be replaced.



Since it is so important to keep each gun punching at the enemy during an attack, immediate action must be taken quickly and accurately whenever a casualty interrupts firing. The gun's fire power must be kept in the fight as long as possible, even though it be at a reduced rate.



As soon as possible after the engagement, remedial casualty action must be taken to put the gun back into full automatic operating order.



The 3"/50 will work well only if you take good care of it. Properly maintained, it will operate faithfully, with a minimum of casualties and plenty of effective hits.